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OUR BEST WISHES

The publishers of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION take this opportunity to wish their many readers and friends a very Joyful Christmas and a Happy and Prosperous New Year. May the hardships, worries, and misfortunes of 1931 be forgotten in the blessings and enjoyments of 1932.

A REMINDER

The title-page and index for Volume 20 of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION is ready for you. Remember that you will have to write us if you wish a copy.

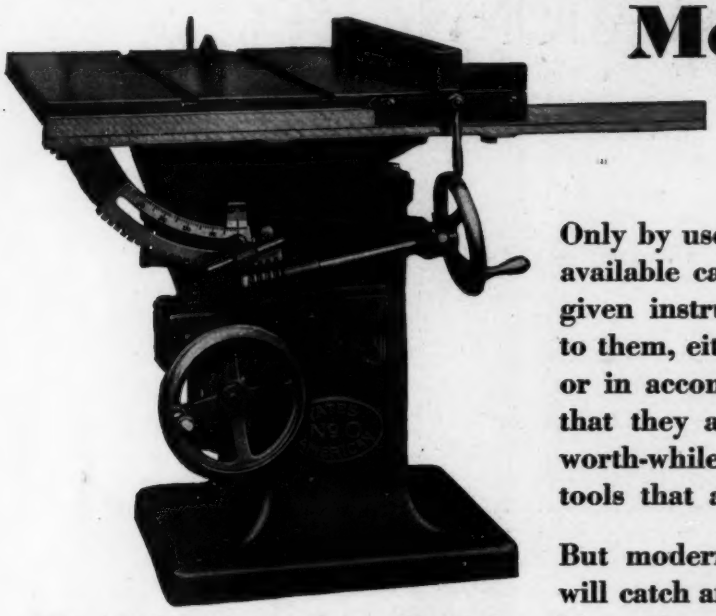
THIS MONTH'S COVER

The picture used for our cover this month is another one of the series that illustrates actual industrial practices. The autogenous welder is a product of modern times and methods. Courses in this type of welding are being offered in more and more of the schools devoted to industrial-arts and vocational work.

OUR ANNUAL PROJECTS NUMBER

In this issue there are 28 problems and projects for the shop teacher. No doubt, one or the other will be of interest to you. Probably you have as good or better to offer to your fellow industrial-arts teachers. Why not submit them for publication and in that way help to supply your coworkers with workable ideas and at the same time record what is being done in the industrial-arts work of the day.

Modern Instruction Demands Modern Tools

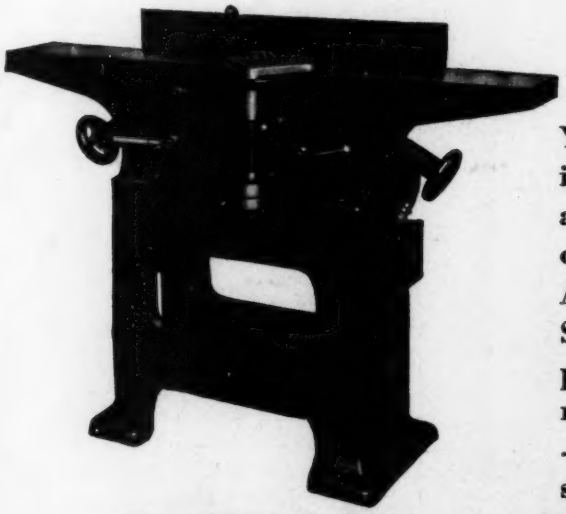


No. 0 Variety Saw Bench

will do practically everything that the larger machines of this type do. Direct motor driven; controls and adjustments conveniently placed.

Only by use of the most modern equipment available can pupils in the manual arts be given instruction that will be of real value to them, either in attitude toward their work or in accomplishment. Students like to feel that they are learning something new and worth-while and they are not interested in tools that are clearly relics of another day.

But modern machinery electrically driven, will catch and hold the pupil's interest, make his work easier, his progress more rapid and permit the accomplishment of projects that would otherwise be impossible.



No. B-11 Jointer

designed for sundry work in manual training schools. Sturdy, simple in operation, with direct motor drive.

Yates-American Woodworking Equipment

Yates-American modern equipment is doing its part in training students in the manual arts in schools large and small, in all parts of the country. For instance the Yates-American B-11 Jointer and No. 0 Variety Saw illustrated herewith are among the most popular items of school woodworking equipment in use today. Modern to the last degree —in design, electrical power equipment, and safety guards—they are worthy of the keenest interest and highest efforts of every student.

Send for a circular of these valuable tools.

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

VOLUME 21 JANUARY, 1932 NUMBER 1

Research in Industrial-Arts Education

*William L. Hunter**

UNTIL recently, comparatively little interest has been shown among industrial-arts teachers in attempting to solve educational problems scientifically. The thesis in connection with the master's degree has in most cases been endured rather than enjoyed.

However, this attitude of mind on the part of some industrial-arts teachers is fast changing. They are beginning to realize as never before that there are many problems to which an answer must be found before real progress can be made.

The "guess" must be taken out of industrial-arts education, and science must combine with philosophy. Problems must be defined, procedures must be outlined, measuring instruments devised, data collected, facts weighed, conclusions drawn, and findings must be tested in shop and classroom.

Research means the setting up and weighing of assumptions, the selection of the best of several methods of attack, the patient search for all possible material which will help in the solution of a problem, the recognition of minor problems which must often be solved before the answer can be found for the major problem, and the willingness often to go a lone road heretofore untraveled by other investigators. Research means much more than sending out a questionnaire. Research requires more than just enough intelligence to calculate correlation or to run an adding machine. Research means seeking the truth howsoever long and devious the pathway may be to its hiding place.

Industrial-arts teachers have been slow to become interested in research, but because of this they are less likely perhaps to make some of the mistakes which research workers have made in academic education. It is not likely, for instance, that industrial-arts teachers will plunge headlong into tests and measurements and jump to the many erroneous conclusions as did the testers and measurers in other fields. It is not likely that industrial-arts research workers will build up such involved mathematical investigations on such exceedingly shaky assumptions as did some of those who have preceded us in academic research.

Perhaps it is a blessing in disguise that industrial-arts teachers have been slow to become enamored of research, but having been slow to take up the challenge it is hoped that they will proceed surely and sanely to the solution of the many problems which confront them. The following list of problems has been suggested by approximately one hundred experienced teachers of industrial arts:

1. The value of instruction sheets in industrial-arts education.
2. Teaching load of industrial-arts teachers.
3. Efficiency of various methods of teaching industrial arts.
4. Standardization of certain industrial-arts tests.
5. A validity study of certain industrial-arts tests.
6. What is taught in the average general shop in the Middle West.
7. Standards for grading industrial-arts work.
8. State requirements for industrial-arts teachers over the U. S.
9. The industrial-arts-shop library.
10. The optimum length of shop period.
11. Organization of industrial arts in the small rural high high school.
12. Tool storage and checking systems.
13. The value of industrial arts as compared with academic subjects.
14. The slow pupil in industrial arts.
15. A rating scale for industrial-arts projects.
16. An analysis of 25 general-shop layouts.
17. Industrial-arts libraries in teacher-training institutions.
18. A rating scale for teachers of industrial arts.
19. A code of ethics for industrial-arts teachers.
20. Visual-instruction methods in industrial arts.
21. Adapting the industrial-arts course to pupil needs.
22. Correlation of industrial arts with other departments of the school system.
23. Shop accidents and safety.
24. Required floor area for industrial arts.
25. Reduction of cost of supplies for the school shop.
26. The proper relation of industrial-arts skill and knowledge.

*Head of Industrial-Arts Department, Iowa State College, Ames, Iowa.

27. Mechanical ability and the I.Q.
28. An analysis of 25 unit-shop layouts.
29. Development of curriculum and organization in industrial arts.
30. The part the industrial arts play in the diagnosis and treatment of young school failures.
31. A study of teaching costs in industrial arts.
32. Locating causes of failure to learn tool processes and related information.
33. Setting up performance tests to determine progress in industrial arts.
34. Common errors in shop technique.
35. Determination of the reliability of certain industrial-arts tests.
36. Teaching comprehension and industrial-arts achievement.
37. Instructional aids in the handling of large classes.
38. Ways of increasing the interest factor in industrial-arts work.
39. Methods of conducting industrial-arts exhibits.
40. Methods of advertising industrial-arts work.
41. Duties of the industrial-arts administrator.
42. Shop equipment.
43. Increasing the efficiency of the industrial-arts shop.
44. Ventilation of the industrial-arts shop.
45. The economic value of industrial-arts education.
46. A study of unit costs of typical shop installations.
47. Home-mechanics content based on consumers' needs.
48. Extracurricular activities of industrial-arts teachers and their effect on teacher efficiency.
49. Coördination of industrial arts with other school subjects.
50. Illumination of the industrial-arts shop.
51. Methods of shop finance.
52. The extent to which repairwork in the shop is justified.
53. A validation of drawing content for industrial arts.
54. History of industrial arts in the Middle West.
55. Evaluation of an industrial-arts course of study on a basis of the Seven Cardinal Principles.
56. An industrial-arts course of study for teacher-in-training in a Middle West college or university.
57. A reading vocabulary for industrial-arts pupils.
58. A uniform reliability comparison of standardized industrial-arts tests.
59. A rating scale for mechanical drawings.
60. History of industrial arts in the Middle West.
61. A spelling vocabulary for industrial-arts pupils.
62. Scientific determination of industrial-arts content.
63. Accounting systems for industrial arts.
64. Subject combinations of industrial-arts teachers.
65. Industrial-arts content for girls.
66. Effectiveness of various methods of demonstration.
67. Supervision of industrial arts in the large city.
68. An analysis of the work of the average industrial-arts teacher.
69. Training and experience of one hundred leaders in industrial arts.
70. Accomplishment on various forms of test material.
71. The predictive value of certain mechanical-drawing tests when used in college.
72. The production method of teaching industrial arts versus the individual method.
73. The improvement of the written-essay industrial-arts examination.
74. Correlation of information and performance tests in mechanical drawing.
75. Laws of the several states affecting industrial-arts teaching.
76. The extent to which industrial-arts shops are required to do work for the school.

Many of the problems in the foregoing list are entirely too comprehensive for solution by any one individual in the time that an industrial-arts teacher ordinarily has at his disposal. When this is the case the problem must be broken up into smaller units and each restated so as to be suitable in scope for the investigator concerned.

Some problems are by nature easy to attack; some are intangible and difficult to really answer. Often those problems easiest to handle are the very problems to which an answer is least worth while. On the other hand, many problems which seem to evade every scientific effort to answer them are most important.

There are some who question the value of research in industrial arts, but its need is quite apparent if one but recites some of the advances which have been made in academic fields because of research. Pupils now learn to read the printed page in a fraction of the time it took children two decades ago, all because research workers attacked certain problems in reading and discovered new and vastly improved methods of teaching the art. It may be that in the matter of teaching the reading of mechanical drawing to industrial-arts pupils that research workers will soon discover that our methods of teaching are cumbersome and inefficient. The total value which can come from such research investigation can never be measured in terms of dollars and cents alone.

It is just as necessary that industrial-arts teachers become skilled in the use of the tools of research as that they be able to handle the tools in their shop. The construction of objective tests, determining correlation, making graphs and distributions, understanding what is meant by standard deviation, probable error, and so on, are becoming more and more necessary if industrial-arts teaching is to be done efficiently and intelligently. Good pedagogy demands scientific thinking. The ideal, as far as industrial arts is concerned, is that every teacher shall be a research worker. Research divorced from classroom practice is likely to be meaningless; classroom practice which ignores research is likely to be antiquated and inefficient. Industrial-arts teachers should come to recognize the problems which confront them and proceed to solve them to the end that shop teaching becomes a pleasure and not a drudge, a challenge and not a task.

COÖPERATIVE EDUCATION

A boy or girl who does not expect to be a mechanic, is all the better for knowing how to handle common tools — to mend a school bench, make a blackboard, or a set of shelves. But we feel that the student who can take a regular apprenticeship, or a partial one, gets most out of the school; and most of its bone and sinew comes up through the shops, with from one to two years in the night school, ending with the day classes and working two days in the week. — *Southern Workman.*

Outline of Course I in Auto Mechanics for Senior High Schools

*H. Allan Lacey**

(Time: 5 periods a week for 40 weeks)

This auto-mechanics course is planned to give the student a general knowledge of the modern automobile, enable him to make some of the less difficult repairs and to help him in choosing a vocation. The jobs selected include work on all the major units of the car. Naturally some will require much longer to complete than others. Senior-high-school students should have no difficulty in grasping the related science which makes the ownership and operation of an automobile a much greater pleasure than would be possible without that knowledge.

Job No. 1
TO REMOVE TIRE AND PATCH TUBE

Aim

To teach how to remove tire from rim and patch tube.

Operations

Teach How to: remove tire from rim; take out tube; patch tube; examine casing; replace tube and flap; mount tire on rim; inflate and test.

Related Information

Science: Discuss tire construction and necessity of proper inflation; some results of underinflating — rim cuts, blow-outs, etc.

Tools and Materials: Pupils list all tools and materials used. Discuss relative merits of cement patching and vulcanizing, use of blow-out patches, plugs, etc.

Terminology: Pupils learn and write up meanings of terms and function of parts listed: rim, felloe, lug, rim bolt, flap, valve cap, dust cap, underinflation, rim cut, puncture, blow-out.

Safety: To teach correct method of jacking up car, so as to avoid accidents.

Computation: Pupils find distance car travels at each revolution of wheel. Teach significance of figures indicating tire size. Teach how to read pressure gauge.

Drawing: Pupils make cross-section drawing showing rim, flap, tube, and tire in proper position.

Guidance: Discuss work of tire-factory workers.

References[1] and Illustrative Material

Automotive Essentials, p. 387; *Automotive Trade Training*, p. 581; *Automobile Encyclopedia*, p. 591. Sections of tires. Old tires showing result of abuse.

Job No. 2
COMPLETE LUBRICATION JOB

Aim

To teach how to completely oil and grease a car.

Operations

Teach How to: fill grease gun; clean fittings; use gun; clear plugged fittings; oil springs; inspect and fill transmission and rear end; grease universal joints; fill oil cups; drain and refill motor.

Related Information

Science: Discuss friction and effect of lubrication, correct lubricant to use in different places, special requirements of motor oils.

Tools and Materials: Pupils list all tools and materials used. Teach operation of different types of guns: Alemite, zerk, dot, etc. Discuss operation of centralized chassis lubricating systems.

Terminology: Pupils learn and write up meaning of following: grease cup, grease gun, Alemite, zerk, cup grease, 600W, heavy body, light body, viscosity.

Safety: Teach never to work under a car while motor is running.

Computation: Pupils find cost of job, figuring time and material used.

Drawing: Pupils draw diagram of chassis showing all parts needing lubrication, kind of lubricant to use and how often.

Guidance: Discuss work of service-station men.

References and Illustrative Material

Automotive Trade Training, p. 175; *Automotive Essentials*, p. 109; *Automobile Encyclopedia*, p. 761. Old bearings showing result of poor lubrication.

Job No. 3
CLEAN AND TEST SPARK PLUGS

Aim

To teach how to remove, clean, and test spark plugs.

Operations

Teach How to: remove, take apart, clean, adjust, test, and replace spark plugs.

Related Information

Science: Discuss high voltage electricity as applied to ignition, effect of motor compression on resistance at spark-plug gap, theory of transformer and condenser, special qualities necessary for spark-plug insulator material.

Tools and Materials: Pupils list tools and testing equipment used.

Terminology: Pupils learn and write up meaning of terms and function of parts listed: spark plug, core, electrode, shell, lock nut, gaskets, high tension, ground.

Safety: Teach pupils to use care and correct wrench when removing spark plugs in order to avoid skinned knuckles and broken porcelains.

Computation: Pupils add leaves of thickness gauge to total correct thickness to test gap.

Drawing: Pupils draw cross section of spark plug showing all parts.

Guidance: Discuss work of automotive electrical experts.

References and Illustrative Material

Automotive Essentials, p. 205; *Automotive Trade Training*, p. 387; *Automobile Encyclopedia*, p. 233; *Facts About Spark Plugs*, by Champion Spark Plug Co.; *Delco Remy Service Manual*.

Job No. 4
INSTALL NEW RADIATOR HOSE

Aim

To teach how to remove old hose and replace with new.

Operations

Teach How to: drain radiator, remove hose clamps, remove hose, flush radiator, and install new hose.

Related Information

Science: Show necessity of flexible connection between radiator and motor. Compare tubular and honeycomb radiators as to cooling ability and durability. Discuss and illustrate thermosiphon and pump circulating system. Discuss air cooled motors, difference in operating temperatures of water and air cooled motors. Advantages of each type.

Tools and Materials: Pupils list tools and materials used on this job. Discuss construction of hose. Use of radiator-cleaning compounds. Steam as a cleaner.

Terminology: Pupils learn and write up the meaning of the following: thermosiphon, radiator, hose clamp, water jacket, pump.

Safety: Show proper way to cut hose so as to avoid injury to the hands. Discuss necessity of clean cooling system (confined boiling water must burst through somewhere).

Computation: Measure to find hose needed and total length required.

Drawing: Pupils show by sketch the parts of thermosiphon cooling system and path of water.

Guidance: Discuss work of general garage mechanic.

References and Illustrative Material

Automotive Trade Training, p. 208; *Automotive Essentials*, p. 139. Old hose connections showing condition after long period of use.

*Greenport, L. I., New York.

[1]The textbooks referred to in this and the following lessons, are: *Automotive Essentials*, Ray F. Kuns, The Bruce Publishing Co., Milwaukee, Wis. *Automotive Trade Training*. Ray F. Kuns, The Bruce Publishing Company, Milwaukee, Wis., *Automobile Encyclopedia*, A. L. Dyke, A. L. Dyke & Co., St. Louis, Mo.

Job No. 5
REMOVE AND CLEAN MOTOR HEAD

Aim

To teach how to remove, clean, and replace engine head.

Operations

Teach How to: drain radiator; disconnect hose from head; remove all accessories from head; take out all cap screws; lift off head; clean piston and valve heads; inspect gasket and renew if necessary; replace head.

Related Information

Science: Discuss advantages of various shaped combustion chambers and effect of carbon. Explain meaning of compression ratio and displacement. Discuss different types of valve arrangement: I head, L head, T head, and F head.

Tools and Materials: Pupils list all tools and materials used and explain use of any special ones. Explain construction of head gasket and the reason for this special construction. Discuss use of various binding compounds: shellac, Formagasket, etc.

Terminology: Pupils learn and write up the meaning of the following: compression; high-compression head; compression ratio; displacement; combustion chamber. Discuss doped gasoline.

Safety: Teach how to remove head without injury to gasket or hands.

Computation: Pupils find motor displacement from bore and stroke.

Drawing: Pupils draw cross section of head showing shape of firing chamber.

Guidance: Discuss work of patternmaker.

References and Illustrative Material

Automotive Essentials, p. 48; *Automotive Trade Training,* p. 166. Various heads showing different designs.

Job No. 6
REPACK WATER PUMP

Aim

To teach how to pack the glands of a water pump to prevent leaking.

Operations

Teach How to: determine whether or not the pump needs repacking; back off packing nuts; put in packing as recommended by manufacturer; tighten nuts.

Related Information

Science: Discuss centrifugal pump and its use; advantages of pump system over thermosiphon; necessity of packing stuffing boxes.

Tools and Materials: Pupils list all tools used and describe any tools or materials used for the first time. Discuss different kinds of packing material. Special materials for worn shafts.

Terminology: Pupils learn and write up the meaning of the following: pump; shaft; impeller; pump case; packing nut; stuffing box.

Safety: Teach pupils to see that motor is stopped before making any adjustments. Never work around any machine with loose, wide sleeves.

Computation: Give gear ratio of crankshaft to pump shaft and have pupils find speed of pump shaft when crankshaft turns at 1000 r.p.m.

Drawing: Pupils draw section of pump showing case, shaft, and impeller.

Guidance: Discuss work of assembling in automobile factory.

References and Illustrative Material

Automotive Trade Training, p. 199; *Automotive Essentials,* p. 135; *Automobile Encyclopedia.*

Job No. 7
ADJUST FRONT WHEEL BEARINGS

Aim

To teach how to remove front wheels, clean, grease, and adjust front wheel bearings.

Operations

Teach How to: jack up front end; remove front wheels; clean and inspect bearings; pack with grease; replace, adjust, and cotter in place.

Related Information

Science: Discuss work of front wheels; support, revolve, steer, and brake. Types of bearings; roller and ball. Elimination of friction. Show result of too tight or too loose bearings.

Tools and Materials: Pupils list all tools and materials used on this job. Discuss reasons for types of lubricant used.

Terminology: Pupils learn and write up the meaning of the following: spindle; cone; cup; king-bolt; steering knuckle.

Safety: To show proper method of jacking up car in order to avoid accident. Stress possibility of accident on the road if wheels are not properly adjusted and nuts cottered in place.

Computation: Find number of threads per inch of spindle screw and tell whether it is U.S.S., or S.A.E., or special. Discuss different types of threads. Explain general rules for use of each type.

Drawing: Pupils draw sketch of front axle showing steering knuckle, king-bolt, spindle, and bearings.

Guidance: Discuss work of machinist and toolmaker.

References and Illustrative Material

Automotive Trade Training, p. 35; *Automobile Encyclopedia,* p. 906; *Automotive Essentials,* p. 353.

Job No. 8
ALIGN FRONT WHEELS

Aim

To teach how to properly align front wheels.

Operations

Teach How to: test for correct toe-in; change toe-in by lengthening or shortening tie-rod; lock in correct position.

Related Information

Science: Discuss front-axle types: Elliot, reverse Elliot, Le Moyne; reason for jointed axle, toe-in, caster and camber. Discuss effect of four-wheel brakes and balloon tires on axle design.

Tools and Materials: Pupils list all tools and materials used. Explain use of aligning jig and other methods that may be used.

Terminology: Pupils learn and write up the meaning of the following: tie-rod; axle; caster; camber; steering arm; toe-in; drag link.

Safety: Teach that when both front wheels are off the floor, great care must be taken that jacks do not tip to one side and so let the car fall.

Computation: By proportion find how much it would be necessary to move the tie-rod in order to change the toe-in ½ in.

Drawing: Pupils show by drawing, meaning of toe-in, caster, and camber.

Guidance: Same as for Job No. 4.

References and Illustrative Material

Automotive Essentials, p. 353; *Automotive Trade Training,* p. 25; *Automobile Encyclopedia,* p. 94.

Job No. 9
COMPLETE VALVE-GRINDING JOB

Aim

To teach how to grind, test and adjust valves.

Operations

Teach How to: remove head; remove valves; clean valves; reface valves; ream seats; grind valves; test; reassemble; adjust. Also teach use of undercutting or overcutting reamers for narrowing seats when necessary.

Related Information

Science: Discuss four-stroke-cycle principal, action of valves, type of valves. Show necessity of tappet clearance because of expansion of metal. Demonstrate result of leaky valve. Discuss cam shape and relation to tappet shape and valve action. Show necessity of narrow seat.

Tools and Materials: Pupils list tools used. Describe use of any materials used. Discuss merit of oil- and water-mixed grinding compounds and stone and reamer refacing and reseating tools.

Terminology: Pupils learn and write up the meaning of the following: valve; cam; reamer; pilot; guide; valve head; valve stem; adjusting screw; lock nut; tappet; push rod.

Safety: Teach how to remove valve springs so as to avoid injury to hands. Discuss care of cuts and burns.

Computation: Pupils to measure valve lift and compute valve area.

Drawing: Pupils draw cross-section view of 45-degree valve showing seat, guide, stem, and head.

Guidance: Discuss work of automobile mechanic in general garage.

References and Illustrative Material

Automotive Trade Training, p. 158; *Automotive Essentials,* p. 91. Show examples of warped, burned, and pitted valves.

Job No. 10
RELINE AND ADJUST BRAKES

Aim

To teach how to remove, reline, assemble, and adjust brakes.

Operations

Teach How to: remove wheels; remove brake shoes; remove old lining; reline; replace and adjust internal and external brakes; both mechanical and hydraulic.

Related Information

Science: Discuss friction as applied to brakes. Two-wheel brakes, four-wheel brakes, mechanical and hydraulic. Explain action of hydraulic brakes. Law of pressure of liquids and gases. Discuss relative merits of hydraulic and mechanical brakes. Internal-expanding and external-contracting. Stress proper liquid for hydraulic brakes.

Tools and Materials: Pupils list tools and materials used. Explain construction of linings; woven, stitched, molded. Proper rivets to use: split and tubular.

Terminology: Pupils learn the meaning of the following: brake rod; shoe; drum; mechanical; hydraulic, wheel cylinder; master cylinder; plunger; washers.

Safety: Stress necessity of good brakes. Show necessity of proper adjustment of brakes to prevent skidding. Show relative efficiency of two- and four-wheel brakes.

Computation: Pupils find number of square inches of braking surface for entire car and then find number of pounds to be stopped by each square inch of braking surface.

Drawing: Pupils make sketch of hydraulic four-wheel-brake system showing all parts.

Guidance: Discuss work of assembling and testing in factory.

References and Illustrative Material

Automotive Essentials, p. 331; *Automotive Trade Training,* p. 53; Literature and Charts from Bendix and Lockheed Companies; *Automobile Encyclopedia,* p. 886.

Job No. 11

TIME AND ADJUST IGNITION SYSTEM

Aim

To teach how to time ignition from marks on flywheel or from position of number one piston.

Operations

Teach How to: find and interpret marks on flywheel; locate correct position of piston; loosen cam on distributor shaft; move cam to correct position; tighten cam; set breaker points.

Related Information

Science: Teach theory of ignition, function of parts: breaker points, condenser, coil. Relation of speed of motor to time of spark. Discuss different kinds of insulation used in automobile work.

Tools and Materials: Pupils list tools and materials used.

Terminology: Pupils learn and write up the meaning of the following: coil; rotor; distributor; breaker points; cap; cam; manual advance; automatic advance; short circuit; broken circuit; high tension; low tension; volt; ampere; capacity.

Safety: Teach danger of a kick back due to too advanced spark; correct position of hand when cranking motor.

Computation: Pupils change 5 degrees to inches on flywheel circumference.

Drawing: Pupils draw diagram of four-cylinder ignition system showing all wires, coil, points, distributor, etc.

Guidance: Discuss work of electrician.

References and Illustrative Material

Automotive Trade Training, p. 325; *Delco Remy Service Manual; Automotive Essentials,* p. 180; *Automobile Encyclopedia,* p. 301.

Job No. 12

REPLACE BROKEN BENDIX SPRING

Aim

To teach how to remove and replace Bendix spring.

Operations

Teach How to: remove starter; take off broken spring; install new spring; reassemble.

Related Information

Science: Teach theory of electric motor, path of current, operation of Bendix drive. Discuss other types of starters.

Tools and Materials: Pupils list all tools and materials used. Explain difference between right- and left-hand springs. Stress need of using new cap-screw locks.

Terminology: Pupils learn and write up the meaning of the following: armature; field, commutator, brushes; laminations; pole pieces; ring gear; series wound; shunt wound.

Safety: Teach how to prevent fire by taking great care in removing starter cable and wrapping it with insulating tape.

Computation: Pupils find speed ratio of starting motor to crankshaft from number of teeth on flywheel and Bendix gears.

Drawing: Pupils draw sketch of Bendix starter showing position of gear when starting motor is in motion and when at rest.

Guidance: Same as Job No. 4.

References and Illustrative Material

Automotive Trade Training, p. 429; *Automotive Essentials,* p. 226; *Delco Remy Service Manual; Automobile Encyclopedia,* pp. 317, 319–330.

Job No. 13

ADJUST THIRD BRUSH

Aim

To teach how to adjust third brush so that generator output will be correct.

Operations

Teach How to: remove inspection cover; clean commutator; loosen screws holding third brush; move brush either to increase or decrease output; lock in place.

Related Information

Science: Teach theory of electric generator, method of exciting field, and part played by third brush. Explain action of generator cut-out and ammeter.

Tools and Materials: Pupils list all tools and materials used. Explain why sandpaper must be used instead of emery cloth in cleaning commutator.

Terminology: Pupils learn and list meanings of the following: third brush; commutator; armature; field coil; shunt; series; cut-out.

Safety: Teach necessity of keeping generator output down to given amperage in order to avoid burned out windings; also necessity of keeping all connection tight.

Computation: Pupils find speed of generator armature when car is traveling at 20 miles an hour.

Drawing: Pupils show by diagram, path of current from generator to battery, showing all parts through which it passes.

Guidance: Same as Job No. 3.

References and Illustrative Material

Delco Remy Service Manual; Automobile Encyclopedia, pp. 331–424; *Automotive Essentials,* p. 216; *Automotive Trade Training,* pp. 466 and 483.

Job No. 14

SOLDERING JOB

Aim

To teach how to solder a terminal to the end of a wire and how to repair a small leak in a tank.

Operations

Teach How to: clean parts to be soldered; operate gasoline torch; clean and tin copper; apply flux; make joint.

Related Information

Science: Discuss action of flux; proper flux to use with different metals; compositions of solder; effect of dirty copper; correct heat of copper and how to determine.

Tools and Materials: Pupils list all tools and materials used.

Terminology: Pupils learn and write up the meaning of the following: flux; copper, solder; sweating; brazing, welding.

Safety: Teach care of gasoline torch and effect of acid flux on clothes.

Computation: Pupils estimate the cost of a job at local labor prices.

Drawing: Pupils draw sketches showing steps in soldering small patch to tank.

Guidance: Discuss work of tinsmiths.

References and Illustrative Material

Automotive Trade Training, p. 577; *Automobile Encyclopedia,* p. 720.

Job No. 15

TO FIT AND ADJUST CONNECTING-ROD BEARINGS

Aim

To teach how to remove old connecting rod; fit, scrape, and adjust new rod.

Operations

Teach How to: remove oil pan; remove oil pipes if necessary; remove rod and piston; take out writ pin; put new rod in piston and replace pin; fit rod bearing to crank by bluing and scraping; replace piston and rod; adjust bearing; replace oil pipes and pan.

Related Information

Science: Discuss changing reciprocating motion to rotary motion; reason for soft bearing metal; necessity of oil; difference between splash and full-force lubrication; clearance in bearings; different types of pistons and advantages claimed for each. Explain different methods of fastening wrist pins.

Tools and Materials: Pupils list all tools and materials used. Teach how to sharpen bearing scraper. Stress necessity of sharp scrapers. Explain use of prussian blue in fitting bearings.

Terminology: Pupils learn and write up meaning of the following: bearing; babbitt; wrist pin; hollow crankshaft; drilled rod; skeleton piston.

Safety: Teach how to block up front end of car so there will be no danger of its falling and injuring workman.

Computation: Measure with micrometers the diameter of crank and change to fractional equivalent. Tell how much it is out-of-round, if any.

Drawing: Pupils draw cross section of connecting rod, showing bearing and wrist-pin bushing or clamp.

Guidance: Discuss work of garage mechanic.

References and Illustrative Material

Automotive Trade Training, p. 147; *Automotive Essentials,* p. 41; *Automobile Encyclopedia,* p. 799. Several connecting rods taken from different cars showing different designs and weights.

Job No. 16

CLEAN AND ADJUST CARBURETOR AND FUEL SYSTEM

Aim

To teach how to clean and adjust carburetor and fuel system.

Operations

Teach How to: remove carburetor; take apart; clean parts; reassemble; adjust; clean vacuum tank; blow out all lines; drain and clean tank.

Related Information

Science: Teach theory of carburetion; law of flow of liquids and gases; ratio of gasoline to air for perfect combustion; devices used to maintain the ratio at all engine speeds. Explain that chemical action during explosion accounts for water from exhaust of cold motors.

Tools and Materials: Pupils list all tools used on this job. Discuss value of gas savers.

Terminology: Pupils learn and write up the meaning of the following: carburetor; jet; float; float valve; needle valve; Venturi tube; butterfly valve; air valve; vacuum tank; combustion.

Safety: Discuss fire prevention in connection with gasoline. Explain spontaneous combustion.

Computation: Using bore and stroke of cylinder, find volume of gas drawn in at each suction stroke with wide-open throttle.

Drawing: Pupils draw cross section of simple carburetor showing jet, air intake, Venturi tube, float chamber, float, and float valve.

Guidance: Discuss work of carburetor expert.

References and Illustrative Material

Automotive Trade Training, p. 219; *Automotive Essentials,* p. 144; *Automobile Encyclopedia,* p. 95; handbook and charts from makers of various carburetors.

Job No. 17

REPLACE RING AND PINION GEARS IN PLAIN-AXLE-TYPE REAR END

Aim

To teach how to install new ring gear and pinion in plain axle; type of rear end, such as Ford Model T.

Operations

Teach How to: remove rear end; take off wheels; remove drive shaft and housing; take housing apart; clean and inspect; take off old gears; put on new; reassemble; adjust.

Related Information

Science: Discuss transmission of power at right angles; operation of differential gears. Explain other types of rear ends; semi-floating, three-quarter floating, and full floating. Discuss merits of bevel gears and worm drive.

Tools and Materials: Pupils list all tools and materials used.

Terminology: Pupils learn and write up the meaning of the following: differential; plain axle; full floating; three-quarter floating; semifloating; torque; Hotchkiss drive.

Safety: Show proper method of raising and holding rear end of car.

Computation: Pupils find ratio of gear by counting teeth on both gears.

Drawing: Sketch pinion gear and ring gear in proper relation to each other.

Guidance: Same as Job No. 4.

References and Illustrative Material

Automotive Trade Training, p. 40; *Automotive Essentials,* p. 313; *Automobile Encyclopedia,* p. 863. Several rear ends illustrating different types.

Job No. 18

TROUBLE FINDING

Aim

To teach how to locate and repair minor troubles which cause a motor to run poorly or to stop.

Operations

Teach How to: recognize the symptoms caused by poor operation of some definite parts of a motor; proceed in a logical manner from the inspection of one to another until trouble is located, and remedy when trouble is found.

References and Illustrative Material

Automobile Encyclopedia, p. 485; *Delco Remy Manual,* Carburetor handbooks.

Before completing the course, each pupil must locate and remedy simple ignition and fuel trouble causing motor to run poorly or to stop.

City Supervision of Industrial Arts

*George Carl Weller**

The Question

If you are a supervisor of industrial arts in a city school system, are you really supervising or "snoopervising"? Are you making friends of the teachers and pupils, or are you constantly on a tour of inspection and reporting to the superintendent on the "inefficiency" of some teacher or teachers?

The Ideal

The real supervision of today is the kind which inspires teachers to personal and professional growth, which improves instruction within the school by making common the best practices everywhere, and which brings to bear the best policy and philosophy of educational processes. Let us hope that if you are a supervisor raised up from the rank and file of the teaching profession that you are still mindful of the tasks of your former associates, that you do not by your attitude create in them a feeling of resentment toward you, and that there will not be tagged to you a common definition of a supervisor—"a teacher who gets more money and does less work."

The Child

Remember that fundamentally it is the child, and the training of the child that is important. Positions of teaching and supervising were not created to give employment to men and women. Education has im-

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proved and schools have grown because parents are interested in the fullest development of the talents of their offspring. The natural consequence, then, is the profession of teaching with its vast membership. And if the child is going to improve and develop to the fullest, the proper teaching methods must be applied, the best equipment must be furnished, and the finest and most pleasant environments must be supplied. That is where you as supervisor come in — to improve and vitalize all of these.

The Architect

The taxpayers are furnishing the money. Are you helping to see that every dollar spent is producing 100-per-cent results? School architects, experts in their line, are everywhere revolutionizing the old-time schoolhouse. Are you in close touch with the best school architects in your community, feeding to them the new ideas that you surely must be constantly getting by visiting schools and associating with teachers — teachers who have to live every school day in their rooms and who always see ways of improving certain architectural features to be embodied in future buildings.

The Salesman

New machines, mechanical devices, and supplies of every conceivable nature are being placed on the market every year. Do you attend the expositions where this equipment is displayed, see it demonstrated, weigh its worth, and carry your findings and recommendations to your superintendent in an effort to have it installed as space and funds are available? Are you keeping a listening ear to the wide-awake teacher who also has come in contact with some good enterprise either through reading or observation? Are you taking time for hearings from factory representatives and salesmen who call upon you to demonstrate their wares? Are you courteous to them? The modern salesman knows his line and is a gentleman, otherwise he would not have been chosen for the job by his company. He commands your respect.

Employer and Employee Organizations

Every fair-sized community has its employer, tradesmen, and labor organizations. How do they feel about you and your school system — your shops, laboratories, methods, equipment? Are they satisfied with the training, with the supplies, with the appliances, and with your graduates? Are the trades of your community willing and able to absorb your graduates? Are graduates in demand? Do you know what the basic needs of the community are with respect to graduates from various departments, or are you turning out a surplus of one and a deficit of another? Do you make friends with the industries and industrial organizations, and do you let them give you assistance? They can be a great help to you. On the other hand, you must know and let them know where their rights leave off and where yours begin. Your brand of statesmanship will certainly be given the acid test when you deal with them.

The Counselor

Progressive school systems now have a system of counseling. Men and women of experience, mature mind, tact, and a deep interest in students are being employed by junior and senior high schools to talk over individual problems with each student, to advise him and to assist him in constructing his program of study to his best abilities and interests. Are you working with these counselors? Do they *all* know the workings and the advantages of *every* vocational department in the school system? Are you satisfied that they are doing the best piece of service possible? Are they making mistakes in their student assignments by placing "round abilities" in "square occupations"? Are you bringing to them the newest and the best mental testing and diagnostic testing material available in order that they may use it to better determine the possible aptitudes of individual students? Do you really know about all the tests? A good place to learn is by attending, and encouraging your counselors to attend, some good university summer session every alternate summer at least. In the final analysis, you, too, are the chief counselor. As you go through the school system, the pupils are sizing you up. Are you making yourself approachable to the students? Do you stop and answer their questions? Perhaps one word of advice dropped off in passing to some eager student will help him steer his course into calm and successful life channels. Remember again — it's the child! That's the justification for your position as supervisor.

The Teacher

And now your relationship with the teachers. You are up and around and moving constantly. Teachers are "put," as it were, day in and day out in the same room, with the same pupils, the same routine. What a contrast between you and the teachers! Keep in mind that all human thinking is tempered by one's environment. The teacher needs some of that optimistic, refreshing, and pleasant outlook on life that you have or should have in your larger field as a supervisor. Don't be finicky, peevish, and critical. Don't strut. Perform some intelligent, helpful leadership. Make life pleasant for the teacher. Remember, too, that most teachers are sensitive to you, to new ideas, to new methods. Talk up to them, not down. A good supervisor is one that eventually "works himself out of a job." Are you performing such unselfish service? Praise the teacher for work well done. And finally, when that work is well done, don't appear in the presence of your superintendent and say "Look what I did!" Don't let the press praise you. Make it your

business to see that proper publicity is given to the person who actually does the work. Spread credit where credit belongs. Don't be afraid of your job. When you've filled it, something bigger will come along for you. You are the creator of opportunities that will permit your associates to work unhampered, peacefully, joyously, and with vitalized constructive energy and perseverance.

A Rating Scale for Shop Teachers

*A. W. Dragoo**

DURING the past decade, child study has received more and more attention. The child has been tested and retested, measured and calibrated, diagnosed and psychoanalyzed; in fact, practically everything has been found out about him except a specific cure for his ills. Now the movement is turning toward the teacher. More and more attention is being given to the analysis and diagnosis of the teacher. What kind of individual is he? What activities does he engage in? How does he spend his leisure? What is his specific preparation for his job? Is he actually doing the job? If so, how does he do it? If not, why not? What preparation and training should be given him to insure progress and ultimate success? What does a truthful detailed analysis of his classroom procedure reveal? What does he do that others would do well to emulate? Where does he need help? Should he be retained in the profession? Should he be promoted? Should he be transferred? Does he deserve an increase in salary? The answer to these and other questions about the teacher and his efficiency are being sought.

It seems clear to those who have studied the problem, that these questions are going to be satisfactorily answered and with the answer will come greater power and skill in dealing with those problems which are now known to exist but about which so little is actually being done. When we are able to analyze the teacher and thereby know what characteristics are specific antidotes for certain disorders in student behavior, intelligent supervision and adjustment can do much to bring the two together. The laws, no doubt, in this respect are as specific and effective as in the physical sciences. It is only necessary for the educator to discover them and provide means and opportunity for their operation.

The field of general education has been at work on this problem of teacher efficiency since about 1904 when C. E. Elliott, of the University of Wisconsin, devised a score card for evaluating teaching efficiency. Many others have followed his suggestion and much work has been done and considerable progress has been made in the solution of the problem. Who are the good teachers and what makes them good, is the question general education is constantly seeking to answer.

Industry has done with the worker what the school has done with the pupil. It has now turned its attention to executives, foremen, department heads, superintendents, and supervisors. The same question is being asked. "Who are our best executives, foremen, etc., and what makes them good?" Here we find the score card or rating scale has proved its worth as a measuring instrument. Many concerns with organized personnel departments use the score card for determining the value of a number of traits thought to be indices of efficiency.

The rating scale shown herewith has been formulated with the hope of securing an answer to the ever-present question as applied to the field of industrial arts. "Who are our best shop teachers and what makes them good?" No claim is made that the scale includes all those elements or traits possible of measurement, but it is believed those included represent typical samples and if honestly judged either by the teacher or by the supervisor, will give a fair index to the teacher's efficiency.

The traits or characteristics included were determined by expert opinion. Arrangement and general form of the scale follows accepted practice in present-day rating-scale technique. The present form has been based on the Purdue rating scale and the Iowa State College rating scale both of which have had wide use in the field of general education. The field of industry is reflected in the graphic rating form and method here employed. Rating scales by The Scott Company and by Professor Max Freyd use the graphic form.

This scale is intended to be used by teachers for self-analysis or by supervisors and directors of industrial arts who are thoroughly competent to judge the traits.

The right side of the scale is the low side and represents a score of 0 at the extreme end of the scale. Ten divisions are provided, separated by vertical lines, making it possible to make as fine a distinction as is desired, ranging from 0 on the right to 10 on the left. In scoring, all that is necessary is to place the scoring template along the scale line and record the grade along the margin of the sheet. The common arithmetical sum of these scores can be computed and the standing or rank determined by reference to the following:

Highest possible score	170
Median score	135
Quartiles	
4th	144 to 167
3rd	135 to 144
2nd	125 to 135
1st	89 to 125

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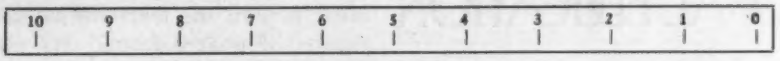
Any individual teacher may find it of interest to rate himself and locate his score on the quartile table. Probably the greatest value of any of the scales is that of self-analysis or appraisal.



Scoring Template

A RATING SCALE FOR SHOP TEACHERS

ALVA W. DRAGOO

Teacher's Name..... Rating Made by..... Date.....

Rate the shop teacher on each of the following seventeen points by placing a check mark ($\surd$) on the point which most nearly fits the description.

1. Preparation	Classwork very carefully planned; knows exactly what he intends to do.	Makes plans but lacks ability to arrange properly; needs some help	Makes little or no attempt at preparation; depends upon the requirements of the moment.
2. Interest in his subject (Personal)	Makes careful analysis of his subject; endeavors to interpret and add new values to its content.	Interest confined chiefly to the development of mechanical skills; narrow in his interests.	Has little interest other than financial reward.
3. Ability to arouse interest in students	Students enthusiastic about their work; interest runs high.	Interest sometimes high—sometimes low; has some difficulty in maintaining uniform level.	Little evidence of interest among students; work seems to be done at demand of teacher.
4. Selection and organization of projects	Selects appropriate projects and organizes them sequentially.	Needs help in selection of proper projects; organizes fairly well.	Projects poorly selected; little evidence of organization.
5. Craftsmanship (Personal)	Workmanship of highest order; takes pride in turning out a fine piece of work.	A fair workman but does not seem to know the finer points in his craft.	Avoids exhibiting his ability; lacks ability to do.
6. Shop management	Shop always in order; conveniently and systematically arranged.	Shop in fair order; could be more conveniently arranged.	Little evidence of a knowledge of efficient management; a poor arrangement of equipment.
7. Class management	Every student seems to know that his best is expected of him; work progresses smoothly.	Students not always sure of their duties and privileges; some disorder.	Little evidence of system; much disorder and wasted time.
8. Personality	Strong initiative; is tactful and self-confident; has excellent judgment.	Fairly aggressive; sometimes lacks self-confidence.	Hesitant, timid, uncertain; has poor judgment.
9. Thinking demanded of students	Development of his projects requires much thought by his students.	Projects too completely analyzed; more needs to be left to the student.	Everything provided; nothing left for the student but mechanical manipulations.
10. Demonstrations	Demonstrations short, clear, specific and skillfully carried through.	Demonstrations sometimes lack definite purpose; are usually accurate.	Demonstrations lack purpose and skill; much time wasted.
11. Coöperativeness	A good team worker; is loyal and unselfish.	Takes suggestions rather reluctantly; is sometimes critical.	Others must work with him; no ideas are quite so good as his own.
12. Feeling between instructor and students	Feeling of good will prevails strongly.	Neither good will nor antagonism seems to prevail.	Instructor tends to arouse fear, antagonism, and resentment in students.
13. Sense of fair play	Is always considerate of students' rights; renders decisions only after knowing all the facts.	Aims to be considerate, but sometimes renders premature decisions.	Forms opinions and makes decisions not warranted by the facts.
14. Excellence of workmanship required of students	Accepts only the best work his students can do; is a good judge of quality; evaluates properly.	Sometimes accepts work of inferior quality.	Accepts almost anything the student does; is unable to evaluate student's ability.
15. Willingness to receive criticism	Modifies his acts in light of good advice; is very appreciative.	Accepts criticism without comment; is sometimes "touchy."	Resents criticism; is self-sufficient.
16. Personal appearance	Is properly dressed for the occasion.	Properly dressed, but sometimes has an untidy appearance.	Dress inappropriate; untidy person.
17. Use of English	Clearly and accurately expresses his thought; has excellent vocabulary.	Meaning sometimes lacks clearness, but is usually accurate in form.	Unable to express his true meaning; scanty vocabulary.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. METZ, Editor

THE WONDERFUL ENGLISH LANGUAGE

The English language, and that goes for many other languages as well, is a wonderful thing. No wonder, the Indians looked upon a written document with superstitious wonder. No wonder, that the illiterate of the past looked upon one who could read, with great respect and accorded him the utmost courtesy.

It is really quite wonderful to think that man can disclose his thoughts and wishes, give directions and information just by covering a page or two with insignificant-looking symbols and characters. And then, the ease with which this method of transmitting ideas may be used in this age. It is true, we moderns — modern only because the present is always later than the past — can by no means be proud of our written missives. There was a time when penmanship meant much more than now, but at that time very few, to say nothing of shop teachers, could afford to own typewriters. Today the man who writes like Ambassador Choate is said to have written, invests in a typewriter, practices a while, and then by the famous one-finger hunt-and-peck system is able to transmit his thoughts in a perfectly readable manner.

The reader is kindly asked to note the expression "perfectly readable manner." That is all that may be claimed for any system, be it reproduced in the most perfect Spencerian or Palmer, with the typewriter, or by means of the printed page. The intelligibility of that which is reproduced, of course, depends upon the writer's skill in expressing his thoughts in words. But — and it is an awful but — how much, too, it depends upon the reader's ability to take the written word, and after reading it, really understand what he has read.

It is perfectly marvelous how words may be twisted to mean almost anything or even nothing. Men who themselves feel perfectly sure that they can write plain and easily understood directions, fail entirely in correctly interpreting plainly worded missives written by someone else. Strangely enough, too, this fault seems to be as common with the educated as among those who have enjoyed less extensive training.

The attempts of the A.V.A. Standards Committee to get industrial-arts teachers to participate in developing a list of learning units for students may be taken as an example. This committee has painstakingly gathered for various subjects the items that the student is to be able to do, the things that he is to know, and what he is to be, and after arranging them in a list, every effort has been made to bring the material before the industrial-arts teacher of the country. In every list — and six of them have appeared so far — it has been plainly stated that the schedule contains:

a) *Tentative* learning units that are to be embodied in a given course;

b) That the units are arranged *haphazardly;*

c) That supervisors and teachers should kindly try out the list on *their* projects, exercises, or what not, in order to turn the tentative list into a really usable register of what industrial-arts students the country over are to be able to do, to know, and to be;

d) To *please return* these findings, together with an altered list from which the useless learning units have been deleted, and the missing ones added, to the committee so that a country-wide study may be made of those that are to be placed in the final list.

It all seems so plain, but the reactions so far obtained are quite discouraging. Only a few seem to really understand what it is all about. Some of the others didactically state, "It is impossible to devise a set of the projects acceptable to all parts of the country." Pray, which one of the members of the A.V.A. Standards Committee ever mentioned that he was trying to pick out projects for the industrial-arts teachers of the United States? Others ask, "Must these learning units be taught in the order in which they are given?" Still others complain, "The order in which the learning units are given in the published lists is all wrong." Yet all the committee has done so far is:

a) To present a list of learning units;

b) To ask to have it tried out and changed to suit individual needs;

c) To have the individual findings returned so that they may assist in making a country-wide study.

Yes, English really is a wonderful language. A plain statement expressed in that tongue means so many different things to different people.

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JUDGE NOT LEST YE BE JUDGED

The woodshop teacher was complaining about some work that the boys in the auto shop had done on his car during the previous week. Evidently someone had forgotten to reëstablish all of the electrical connections after correcting some mechanical troubles on the car. At any rate, while the trouble for which the car had been taken into the school garage had been eradicated, the tail-light refused to function when it was needed.

No doubt, the oversight was vexing. It always arouses one's ire when some part of the car mechanism does not function. The incident, however, hardly merited the string of harsh and denunciatory expressions which flowed from the car owner's lips. He evidently forgot that such things are very likely to happen even in commercial garages where services are paid for on the flat-rate system and not with the "much obliged" which is usually all that the school garage teacher gets for his trouble.

This same woodshop teacher was heard a few days later complaining bitterly about the supervisor's strict inspection on some cabinetwork made in the school shop. "He should remember" so the woodshop teacher said, "that the work is done by students, not by journeymen."

How the unit of measurement changes when used to gauge one's own shortcomings, and those that be-

long to others. How much worse the mistakes of the auto-mechanics shop are than those made in the cabinet shop — when the cabinet-shop teacher is speaking. One wonders whether that blind tail-light episode flashed through that woodshop teacher's mind when his sins of commission and omission were pointed out in the work of his own department. Probably that mental circuit refused to function too. These complainers usually can see only the other person's faults.

Yet one would expect broadmindedness in a teacher. He, above all, ought to be able to see both sides of every question. His job really requires it, because if he takes his work seriously, he must forever judge every act in his schoolwork, first from the teacher's point of view, and then from the student's angle. If he does not do this, he will frequently make grave errors in his work as a teacher.

Why is not the same attitude observed when the work of a school department is judged by a teacher outside of that department? Evidently the biblical exhortation, "Judge not lest ye be judged," is not part of the teacher-training curriculum.

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ARE WE TO BLAME?

News notes from various communities show that, because of the depression, industrial-arts shops in schools have been closed, vocational classes have been suspended, and teachers of these subjects have been discharged. Can these communities afford to experiment for even one year with the lives of the future workers of our country? Are the people who so casually throw out this part of the school's work so blind that they cannot see the advantages of the industrial-arts and vocational courses? Or was the work so poorly given that the school is just as well without it?

There are those who claim that industrial-arts work fritters away the pupils' time without giving them anything of value in return. It would be sad if these statements were really true. Remarks of this kind, however, are usually made on the spur of the moment by men who are expressing personal opinions rather than the results of a serious study. The same general statements are heard about the work given in the other courses found in our elementary and secondary schools. However, such charges must be met and combatted. Industrial-arts work, and that also holds for all of the vocational work, is not yet so entrenched in our American system of education that it is accepted without question. There are still too many who feel that what was acceptable and suitable in the "perfection of the good old days" will amply fill all needs of the present. To them the three R's are still ample preparation for those who have to grapple with life. Transplanted to China, these critics would, no doubt, scoff at the idea that the Chinese soldier needs any more adequate equipment to meet the Japanese armies than the weapons which served his forefathers.

Industrial arts and vocational education must be sold to the community. The work must be made vital. It must function, and those who must take the brunt of making this work effective are the shop teachers themselves. Their own principals and superintendents in most cases have to be converted and shown its value. As a matter of fact, very few school executives have a real appreciation of the work, and hence they cannot be blamed if they arrive at the conclusion that the work might just as well be abandoned in times of distress, especially if the work is not well taught, if the industrial-arts teacher has not tried to integrate his course with the rest of the school curriculum, or if he has done nothing to sell it to the community.

If the industrial-arts teacher can make his shopwork function in the arithmetic class, if he can make it part of the English work, and if he succeeds in showing how it may be used to make the study of history, civics, and geography more real and dynamic, he need not fear that his principal and fellow teachers will not accord due credit to his work. If he can then impress the family, the press, and the business and industrial men of his community with the value of his work, he need never fear that depression will harm his course, nor rob his pupils of the opportunity of deriving the benefits inherent in industrial-arts work.

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TRUE GENIUS NEVER DIES

Carlyle defines genius as the "immense capacity for taking trouble." How well Thomas A. Edison exemplified this in his life. His capacity for taking trouble gave inventions to the world which allow the pauper of today to enjoy conveniences which were unknown to the wealthy and the powerful of even a century ago. From earliest youth, Edison had to work hard, and he never lost the habit which necessity had instilled in him, nor did he lose the taste for the fruit which labor produces — the realization of a problem solved, the exhilaration which comes from succeeding in bending the natural forces to do man's bidding, the satisfaction of doing something that is useful to others.

His own superabundant energy did not only drive him ever onward, but was the cause of inciting others to similar efforts, so that part, and in many cases the major part, of the efforts and achievements of others may rightfully be credited to him.

Edison is dead, yet his example and accomplishments live on. They live in the rich heritage of scientific discoveries, experiments, and inventions which he has left us, but they live no less in the men and women of the present and of the future who received, or will receive, from his life encouragement and inspiration for painstaking effort, for ceaseless delving after knowledge, and for unselfish devotion to an ideal.

They live on also as worthy examples for teachers and pupils alike. For the teacher, Edison's untiring striving for a solution of a problem that he had started, is a powerful incentive to keep on in trying to solve the problems of human relationships that daily arise in the school shop. For the student, Edison's life may be made a veritable *vade mecum* from which may be derived inspiration, direction, and the courage to persevere under trials.

Polished Pebbles

*R. H. Jenkins**

WIDELY scattered over the United States are many kinds of small, interesting stones. Many of these have little or no cash value yet are attractive and interesting through their peculiar coloring and marking. For the collector of such stones there is an added interest in the field of grinding and polishing.

The grinding and polishing of small pebbles are not as difficult tasks as one might be led to believe, the main requisite being patience, good judgment, and careful workmanship. By no means, however, is it intended, through the above statement, to minimize the splendid work of the professional lapidary, but rather to offer encouragement to an amateur who may wish to experiment for himself.

The equipment for grinding and polishing may be very simple, or quite elaborate, depending largely upon the pocketbook of the person interested. In this brief sketch, however, only the minimum requirements will be given, leaving the enlargement to the growing needs of the individual.

The first thing needed is a small polishing head. This can be purchased from almost any supply house for about $2.50.

It should be set up on a bench with a top in the form of a zinc-lined box in order to catch the surplus water used in grinding. Some means of power must next be provided, and for this a little ¼-horse-power motor is amply sufficient. Such a motor would cost from ten to twenty-five dollars depending on whether the purchase was made from new or secondhand stock.

A ¾ by 5-in. carborundum grade A grinding stone also will be wanted. This stone is fastened on one end of the grinding head, and a can of water must be so placed that a fine steady stream of water will run on the stone during the entire period of grinding (see B and C in Fig. 1).

To the other end of the spindle several wooden disks should be fitted, so that they can be attached whenever the occasion demands. At least three are necessary. The first is made so as to fit nicely inside a round embroidery hoop. The disk is also hollowed out on one side on a wood lathe so that when emery cloth is stretched over it the effect is that of a miniature drum (see A and B, Fig. 1). The second disk should be a plain one made of willow, and may vary in size to fit the material at hand. The third one should be of hard wood similar to the first, and turned so as to take another hoop. This time, however, instead of the emery cloth, a piece of soft leather should be stretched tightly over the piece as shown at G in Figure 1.

*Humboldt State Teachers' College, Arcata, California.

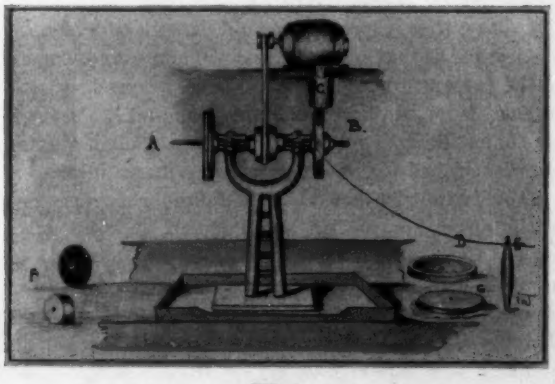


FIG. 1

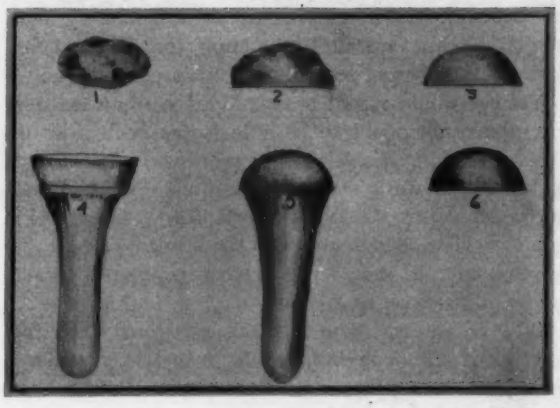
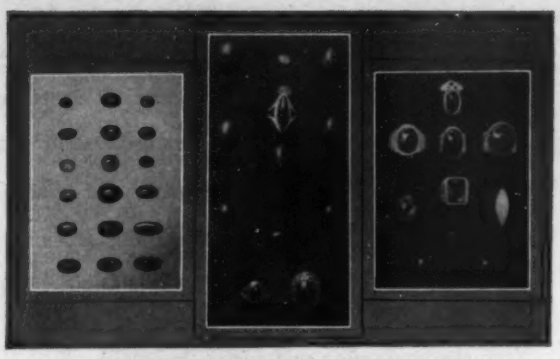


FIG. 2

Two grades of pumice stone should be purchased in small lots. Grade F and FF are good, and while purchasing these it is well to buy a half pound of oxide of tin and a stick of ordinary sealing wax. With the foregoing equipment and supplies, a good job may be done, though, of course, with an equipment comprising metal and fiber brushes, wood laps, and felt buffers (see F and E, Fig. 1) the work can be done much faster.

To grind a small oval-shaped stone for a ring, select from the supply a nice pebble about the size of the one wanted for the ring. Grind the base part first, making it elliptical in shape and as even as possible (see 1 and 2, Fig. 2).

During the process of grinding, the stone can easily be held in the fingers, if care is taken not to injure the hands. It is well, too, not to run the stone too fast, as the amateur is only the more likely to get hurt in the process besides ruining his piece in the grinding. A thousand revolutions per minute would be rapid enough in the beginning, and during the whole process a steady, fine stream of water should be used. Stones crack easily with overheating, and overheating is not at all difficult.



SAMPLES OF WORK DONE BY THE STUDENTS OF THE HUMBOLDT STATE TEACHERS' COLLEGE UNDER THE DIRECTION OF MR. JENKINS

After the base has been finished, the top should be ground to a perfect form, as shown at 3, Figure 2. Here, as in grinding of the bottom, care must be taken not to crack the stone, and it is well not to hold the piece too steadily on the emery but rather to take it up every few seconds, giving more of an upward stroke than a steady grind. Care must be taken, too, to form a gentle slope away from the bottom completely around the edge, keeping decidedly away from a right angle, so that there can be no question of the stone slipping out of the bezel.

The grinding should be done perfectly so that the surface is even in every respect, and as few scratches left on the stone as possible. For polishing, the work should be fastened to a stick, as shown at 4, Figure 2. Whittle out a small stick cupped out at one end slightly to hold the curved surface of the stone. With a small burner of any type, drop some hot sealing wax on the cupped end, and, after heating the stone until it is warm, drop some more wax on it. The two should then be quickly put together while the wax is still hot.

Place the disk with the emery cloth on the polishing head, and hold the work against this until all fine scratches are removed. After finishing with the emery cloth, the willow disk and pumice stone come into play to do a still finer piece of work. Use one or both grades of pumice stone, depending for your judgment on the action of each on the work at hand. Lastly, the oxide of tin and the leather disk should be used to bring out the final polish. It is a little hard to say what the action of the oxide of tin is, but whatever it may be, the results are very noticeable in most cases. With all of the polishes use some water, at least enough to stick the powders to the surface of the work.

After the base is well polished, the work should be removed from the stick and refastened, as shown at 5 in Figure 2. The processes described for the base are then repeated until a perfect piece of work is obtained. The whole process is interesting, and well worth anyone's time.

The Mahoganies

*P. S. Emerson**

THE first authentic record of the use of "Mahogoni" dates back to about 1587. History records that Sir Walter Raleigh had one of his ships badly damaged in a storm off the coast of the West Indies. The ship was repaired with wood from a tree having the native name "mahogoni." From this the term "True Mahogany" originated.

It is easy to see, however, that if this instance had happened along the coast of South America, Africa, China, or the Philippines, "True Mahogany" would be other than West Indian Mahogany.

Mahogany, from 1587 to 1700, went to England and Europe, largely as ship ballast. About 1700, this importation had grown to 300,000 ft. a year. This was largely used in the manufacture of fine furniture. Chippendale was the first great English cabinetmaker to use mahogany in quantity.

Varieties of Mahogany

Experts list about 60 varieties of commercial and other mahoganies. These come from all parts of the tropical world.

From a commercial standpoint, there are four principal sources of supply: Mexico, Central America, Africa, and Philippine Islands.

1. True Mahogany *(Swietenia Mahogoni)* Are Obtained From Cuba, Santo Domingo, Jamaica.

These are called the *Island mahoganies, mahoganies of the Spanish Main, Spanish mahogany, true mahogany.*

Commercially, true mahogany comes only from the islands of the West Indies. Contrary to a widespread belief, the first mahogany was shipped out of the island of Jamaica, and not from Santo Domingo.

The latter mahogany is so heavy that it has to be tied to other logs and floated down mountain streams to a mill. Out of approximately 93 million feet of mahogany imported to the United States in 1925, only about one and one-half million feet was true mahogany (approximately 10 carloads). The latter quantity would not go far in supplying the furniture industry alone.

Identification

a) *Color,* brown to dark red.
b) *Texture,* hard, cross-grained (like birch). Has a white mineral deposit in the grain.
c) *Annual Rings,* distinct.

2. Mexico

Botanical Classification—*Swietenia Macrophylla* (Latter term meaning "broad leaf").

Identification

a) *Color,* dark red to salmon.
b) *Annual Rings,* distinct.

Texture—Close Grain.

a) Hard.

*Cheshire, Connecticut.

b) Soft—baywood, a commercial term to distinguish the soft from hard grade.
c) White mahogany (*Prima Vera*).
Grain—Fairly parallel. Quartered stock shows ribbon grain.

3. Central America

Botanical Classification, same as Mexico.
Identification, same as Mexico.
Texture, same as Mexico.
a) Honduras mahogany.
b) Nicaragua mahogany.
Note: The Honduran and Nicaraguan mahoganies are sold as Mexican mahogany.

4. Colombia

5. Guiana

6. Brazil

7. Africa

Identification
a) *Color,* dark red to light red.
Texture, fine and hard, to soft and fairly coarse.
Grain, frequently wavy, like birch. Quartered stock usually shows very fancy ribbon, and beautiful grain.
Annual Rings, not distinguishable.
Used for: Fancy veneers and furniture, largely. Several varieties are being imported; hard and soft textured.

8. Philippine Mahogany

Supply of Hardwoods in the United States

The supply of fine hardwood is rapidly diminishing in the United States, and each year sees a lowering in requirements for the quality allowed in the best grades of hardwood lumber. Sooner or later our woodworking industries must look elsewhere for a steady supply of fine, wide, clear cabinet wood.

What is needed for the future is:

1. An unlimited supply of large, tall, virgin timber. In the Philippines there is a large supply of trees, 4 to 6 ft. in diameter, and 100 to 150 ft. high.

2. A tract easy of access and easy to log. These conditions are met in the Philippines.

3. Low manufacturing costs. In the Philippines, lumber is manufactured with the best American equipment and supervision, and the industry gives employment to thousands of native Filipinos.

4. Quantity production. Philippine mills cut from 300,000 to 5,000,000 ft. a month (according to the size of the mill).

5. Stock free of duty. (There is no duty coming from our Island Possessions.)

6. Low transportation costs. This stock comes in through the Panama Canal. Water freights are lower than rail freights.

7. An all-round hardwood, for cabinet and other use, with the appearance and characteristics, and performance of the finest of woods, the mahoganies.

8. A wood that markets at about the same price as oak, whitewood, birch, and other domestic woods.

9. Wide range of usefulness: bank fixtures, house trim, caskets, patterns, boats (cruisers, speed boats, yachts), and store fixtures.

10. Unlimited color effect. Philippine mahogany may be stained so that effects similar to walnut, oak, ash, or chestnut, and many shades in between, may be obtained.

Botanical Classification—Is based on type of leaf and flower.

1. Hardwoods have a broad leaf (such as oak and basswood). This classification does not indicate the hardness or texture of the wood.

2. Softwoods have a needle leaf (such as pine and spruce).

Supply

There is an ample supply of lumber in the Philippines.

The growth is much heavier than in the United States. In the Philippines, an average of 5,000,000 ft. a month could be cut for 40 years before the concession would be cleared.

Logging and Manufacturing—Philippine

The process in general is as follows:

1. The trees are sawed from 10 to 20 ft. above the ground and taken to the mill by a logging road or small railroad.

2. The logs are cut up with the best American equipment (either circular saws or band saws).

3. The lumber is piled in the open or under sheds with sticks between each of the boards.

4. After drying, these boards are put aboard steamers bound for the United States.

5. The lumber is taken off these steel steamers with a sling and set on the dock.

6. The lumber is moved from the dock with trucks, and put into a yard from where it is distributed.

Grain—Philippine Woods

Hard, close-grain stock comes from the uplands.
Soft, open, spongy-grain stock comes from the lowlands.
This is exactly opposite to cypress growth.

Dressing Mahoganies

Use a slow feed, and fast knife, especially on quartered stock. In dressing 2 sides, $\frac{1}{8}$ in. is usually allowed.

Veneers

Kinds: (1) sawed, (2) sliced and rotary.
Sawed veneers are usually sawed $\frac{1}{8}$ in. and thicker.
Sliced veneers vary from $\frac{1}{28}$ in. to $\frac{1}{8}$ in. in thickness.
Rotary-cut veneers are cut around the log.
With sliced and rotary-cut veneers, the log, or flitch, is steamed or soaked, and shaved off with a knife.
Sawed veneers are cut with a special veneer saw.

Finishing: Philippine mahogany presents about the same problem as oak. Paste filler and oil stain is usually preferred. Acid, spirit, and water stains raise the grain when used.

Widths, Lengths and Thicknesses

Philippine lumber comes into the United States in random widths 6 to 16 in. wide and 8 to 16 ft. or more in length.

1. Widths. The widths are usually in the even inches: 6, 8, 10, 12, 14, or 16 in.

2. Lengths. The length usually runs in even feet: 8, 10, 12, 14 and 16 ft. Some lengths from 18 to 24 and 26 ft. are brought in for special uses, like boat work, for instance.

3. Thicknesses. The stock is usually sawed $\frac{5}{8}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, and 4 in. thick.

4. Flitches. Flitches are timbers varying from 5 to 10 in. thick, 8 to 24 in. wide, and 12 to 20 ft. long. These are most generally cut up into veneer either by slicing or by sawing.

5. Shorts. Philippine shorts may be had in lengths from 3 to 7 ft. These grade the same as the longer lumber with the same widths. Some importers bring in longer shorts that run 6, 7, and 8 ft. in length. The thicknesses are usually 1, $1\frac{1}{4}$, $1\frac{1}{2}$ and 2 in., but the bulk of it is 1 in. thick. Shorts usually sell for $10 to $15 per thousand under the price of the random-length stock.

Buying. The best way to buy is random width and length stock as the lumber is imported from the Philippines in this manner.

Special Lengths. Special lengths and width require sorting and this adds to the original cost. In many cases this could be avoided, because the average widths in Philippine mahogany are very good and the user can generally pick out what he needs from the average run.

Selection of Grain. Figured or quarter-sawed stock shows a ribbon and each of the ribbons indicate an interlocked grain. For beauty and staying qualities it is highly desirable.

Plain Grain. Plain sawed stock is largely free of ribbon grain and is easier to mill or dress. The usual run of Philippine mahogany contains from 15 to 50 and sometimes 60 per cent ribbon grain. The average importer can furnish either type of stock.

Tallying. Lumber should be checked in by measuring with a lumber scale, and tallied as is done by lumber yards handling hardwoods.

1. Lumber Scale. Place hook over opposite edge of, and read the footage in the column of figures headed by the estimated length.

2. Tallying. Make a column for variations in footage; namely 12', 14', etc. Make four vertical marks, and the fifth a diagonal one across them as shown in the illustration.

3. All thicknesses over 1 in. tallied as 1 inch. One and one-half inch would be tallied as 1 inch, and one half added to get footage.

4. Tally sheets give the number of pieces, and the footage when totaled.

Piling. Lumber in the shop should be put up on strips. Stock does not dry when piled solid. Cover boards should be put on top of the pile to keep top pieces from curling and twisting.

Drying. Air drying. Lumber is piled on sticks. One year per inch of thickness is usually allowed. Because of the large quantities of lumber used, and required on short notice, it is not possible to obtain thoroughly air-dried lumber at all times.

Kiln Drying. Modern humidity-controlled kilns make it possible to dry inch lumber of many hardwoods in 7 to 10 days, to a moisture content of from 5 to 7 per cent, used for cabinetwork.

The lumber is put in the kiln, saturated with live steam, until soft, then dry heat turned on gradually, thus drying the center first.

Casehardening is obtained when the outside of damp lumber is dried, leaving the center wet, or damp. This causes checking and twisting later.

GRADING OF PHILIPPINE HARDWOODS
(Formerly sold as Philippine Mahogany)
Compiled from 1931 National Inspection Rules

Grades	Surface Feet	Defects Allowed	Width in Inches	Lengths in Feet	Short Lengths Allowed	Uses of Stock
Firsts and Seconds 1 in. of sap not considered in defect.	6 9 13 18 & over	1 2 3 4	6 in. and up 5% may be 5 in. if clear	8 ft. and up	25% 8 to 11 ft.	Speed boats, bank and store fixtures, doors, trim, cabinetwork, flooring, veneers
Selects Must grade firsts and seconds one face No. 1 common on reverse face.			6 in. and up	8 ft. and up		Trim, patterns, flooring
No. 1 Common--4 in. wide 6 to 11 ft. must work 2/3 clear in not over 2 cuttings. 12 to 16 ft., not over 3 cuttings. Each 4 ft. over 16 ft. admits one additional cutting. No. 1 Common--5 in. wide and over 6 to 11 ft. to work 2/3 clear face, not over 2 cuttings.			4 in. and up	6 ft. and up	4 to 16 ft. admits 10% 4 ft. to 7 ft. 1/2 of this may be 4 ft. and 5 ft.	Corestock in veneered cabinet work novelties
No. 2 Common No limit to cuttings, no restrictions as to heart center. Gross breaks, one defect.			3 in. and up	6 ft. and up	4 ft. to 16 ft. admits 30% 4 ft. to 7 ft. 1/3 of this may be 4 and 5 ft.	Corestock Novelties
No. 3 Common All pieces must work 25% sound (minimum width 1½ in.) No cutting considered of less than 36 sq. in.			3 in. and up	2 ft. and up	4 to 16 ft. admits 50% 4 ft. to 7 ft. ½ of the 50% may be 4 and 5 ft.	Corestock Novelties

Standard Defects

A. One knot 1¼ in. in diameter.

B. One split equal in length in inches to surface footage, diverging not over 1 in. per foot in length.

C. Wane or equivalent in other defects, 1 in. wide, ⅙ length of piece along the edge or its equivalent at one or both ends. Wane defect may extend through thickness of piece showing on both faces.

D. Two ¾-in. diameter knots, or equivalent, not more than two defects of this kind. Each additional equivalent defect is considered one additional defect. Worm, grub, knot, and rafting-pin holes allowed not exceeding one standard knot defect described above. (1¼ in.)

E. Defects larger than one standard defect (except wane and split) considered on following diameter measurement: 2½ in. knots or equivalent 2 defects; 3¼ in. knots or equivalent 3 defects; 5 in. knots or equivalent 4 defects.

F. Heart center and other defects not defined as standard defects that do not damage the piece more than standard defects allowed are equivalent defects.

Commercial grades offered:

Dark clear (red in color) nonwormy (Fas) Firsts and seconds.

Light clear (chestnut to pink in color) nonwormy (Fas) Firsts and seconds.

Dark wormy (red in color) fine wormholes no defect (seconds).

Light wormy (chestnut to pink) wormholes no defect.

Owing to the fineness of wormholes in Philippine mahogany, only those visible to the eye in rough lumber are considered.

Grading Rules: Complete grading rules (hardwood) may be obtained from National Hardwood Lumber Association, 2008 Straus Building, Chicago, Ill.

Grades of Hardwood Lumber

(Compiled from 1929 National Inspection Rules)

Ash, beech, birch, hard (or sugar) maple, hackberry, sycamore, plain (red or white) oak, and locust may be obtained in grades 1s and 2s, selects, No. 1 common, No. 2 common, sound wormy, and No. 3 common.

Butternut, basswood, soft elm, soft maple, buckeye, walnut, steamed walnut, willow, cherry, black gum (ribbon stripe), sap gum (gum only), cottonwood, tupelo, magnolia, and aspen may be obtained in grades 1s and 2s, selects, No. 1 common, No. 2 common, and No. 3 common.

Chestnut may be obtained in grades 1s and 2s, selects, No. 1 common, sound wormy, No. 2 common, and No. 3 common.

Poplar, or whitewood, may be obtained in grades 1s and 2s, saps, selects, stained saps, No. 1 common, No. 2 common, No. 2A common, No. 2B common, and No. 3 common.

Red birch used for battens, turning squares, pickets, lath, shingles (bests, primes, star A star, economy), and clippers may be obtained in grades 1s and 2s, selects, and No. 1 common.

Mexican and African mahogany may be obtained in grades 1s and 2s, selects, No. 1 common, No. 2 common, No. 3 common, clear strips, No. 1 common strips, wormy strips, 1s and 2s pin wormy, 1s and 2s A pin wormy, No. 1 common N pin wormy, No. 2 common B pin wormy, 1s and 2s shorts, common shorts, and pin wormy shorts.

Cuban and San Domingo mahogany may be obtained in grades 1s and 2s, selects, No. 1 common, No. 2 common, No. 3 common, log run, 1s and 2s shorts, wormy, and pin wormy shorts.

Aromatic red cedar may be obtained in grades 1s and 2s, No. 1 common, No. 2 common and better, and No. 2 common.

Cypress may be obtained in grades tank 1s and 2s, selects, No. 1 shop, No. 2 shop, No. 1 common, No. 2 common, No. 1 boxing, No. 2 boxing, and peck in the following finishes: A, B, C, D, panel, siding, flooring and ceiling, partition, car roofing, car siding, and car lining.

WORTH-WHILE CONTRIBUTIONS

Vocational education has in recent years made some rather clear-cut and worth-while contributions to the field of general education. Among them are: (1) the principle and the technique of job analysis as a means of determining teaching content; (2) emphasis upon objectives (as determined by the actual requirements of adult life) in course of study building; and (3) the project method of teaching. — *F. T. Struck.*

Models of Interiors as a School Problem

*A. G. Pelikan**

THE making of model boats, airplanes, etc., has long fascinated boys in the various industrial-arts shops throughout the country. That this type of work has added considerable stimulus and interest to their work can hardly be denied. That it has given these boys the opportunity for learning good construction and craftsmanship, coupled with the necessity for the application and knowledge of design is also generally recognized.

In order to achieve good results in the teaching of any subject it is most desirable to first establish such an interest in the particular subject that students will approach their problems not as assigned and irksome tasks, but as fascinating experiments which when once started they will not want to leave until completed.

The application of skill to monotonous and inartistic objects is a waste of time and energy, while to place emphasis on skill through repeated drills and formal exercises is apt to disgust many bright pupils to such an extent that an aversion for that subject (and sometimes for the teacher) persists even after they leave school. There seems to be no valid reason why the industrial arts may not be used to correlate with other school subjects in the grades or in the junior high school.

COLONIAL ROOM, MADE BY LORRAINE POLLWORTH, WASHINGTON HIGH SCHOOL, MILWAUKEE, WIS.

MODERN ROOM, MADE BY GERTRUDE KUNDMAN, STATE TEACHERS' COLLEGE, MILWAUKEE, WIS.

*Director of Art, Milwaukee Public Schools, and Director, Milwaukee Art Institute, Milwaukee, Wis.

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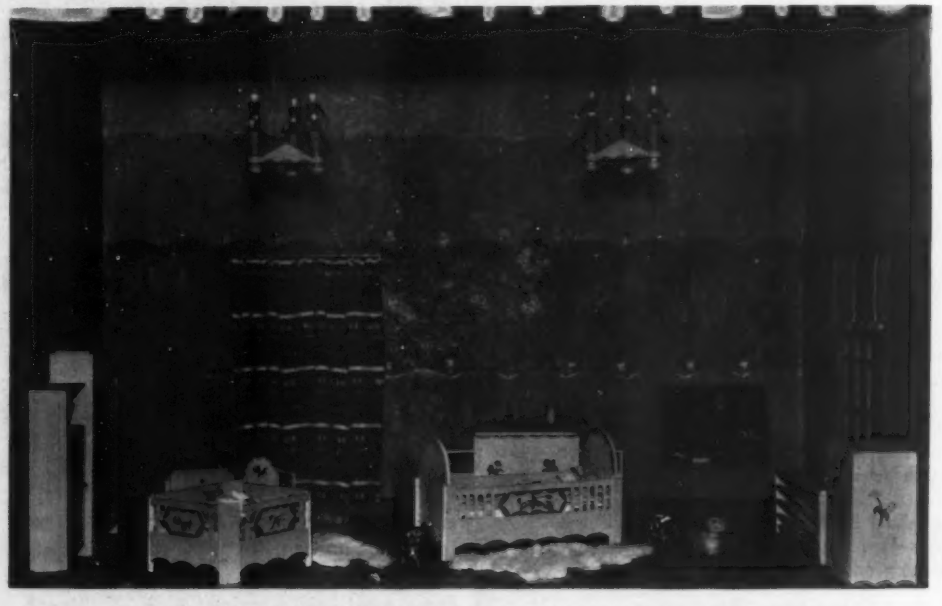
DETROIT MICH.

Since much of the work of the manual-arts departments deals with those items which go into the home to make rooms more livable or convenient, the study of good interiors has a decided practical value, as well as considerable aesthetic possibilities.

An interesting series of models of interiors were recently made under my direction by three of our art teachers and one graduate from the art department of the State Teachers College. These models were made in connection with the Milwaukee Home Show and were used to illustrate various types of interiors. To construct any of which in actual size would have meant a considerable expenditure of money, they were therefore, made up as scale models with the following dimensions: width, 3 ft.; depth, 2 ft.; height, 3 ft., so as to be large enough to be viewed by the people passing by. Any suitable scale may, of course, be used to satisfy particular needs.

A study of the illustrations showing these model interiors will show that many different types of art- and craftwork have had to be utilized in the construction of the various objects. In the colonial room, for instance, all of the small pewter dishes were actually made out of pewter, while in the medieval banquet hall the lighting fixtures, the stained glass, the wooden beams, as well as the various accessories called for a high degree of technical skill, a knowledge of modeling,

SPANISH ROOM, BY R. E. COTE, BOYS' TECHNICAL HIGH SCHOOL, MILWAUKEE, WIS.



CHILD'S ROOM, MADE BY R. E. COTE, BOYS' TECHNICAL HIGH SCHOOL, MILWAUKEE, WIS.

form and color and also a knowledge of historic ornament and costumes. That this type of problem correlates most effectively with the English department or the history department is self-evident. In the case of the colonial room, this was carried out with such a high degree of understanding and ability, that it has been acquired for the children's gallery of the Milwaukee art institute. The modern room, and the child's room, required a great deal of preliminary reading on modern art, and the making of numerous sketches from French and German art magazines before the problem could be attempted. The furniture shown in the child's room was adapted from a design by one of the leading contemporary French designers. It shows a fine understanding of the appropriate use of material and clearly illustrates that attractive but simple furniture may be constructed without a single bit of turning or carving. Where decoration and color has been used, it has been used with knowledge and feeling.

MEDIEVAL BANQUET HALL, MADE BY REBECCA CHASE, WASHINGTON HIGH SCHOOL, MILWAUKEE, WIS.

Although these models were made by teachers, those students who were given an opportunity to assist considered it a rare privilege and worked voluntarily and enthusiastically, without credit, even outside of school hours.

These models have been enjoyed by children and by adults and seem to furnish a splendid opportunity for a variety of interesting manual-arts projects.

A CLOSE SHAVE

A Drama in One Act

Allen D. Backus*

Prologue

EVERYONE who attempts to write is at some time or other overwhelmed with the desire to write a play. I have never had the urge, and so as a preventive I have written this one-act drama. It does not contain much in the way of a plot, and the dialogue does not amount to a great deal; but there is a moral connected with it which will bear your close scrutiny. Bill may only bring to mind some individual of your acquaintance; on the other hand, Bill may be you. We do not wish to be severe or unkind, but there are a large number of Bills teaching manual training.

The Play

Characters:

BILL: a manual-training teacher.

OLD-TIMER: one who has risen from the ranks.

Place:

A corner of Main Street where BILL and OLD-TIMER have just met.

Time:

After school in the afternoon.

OLD-TIMER: Hello, Bill, how are things?

BILL: Not so good; I'd like to chuck everything.

OLD-TIMER: How come?

BILL: I've worked for this old board of education for six years now. I've worked hard and I haven't loafed on the job either. I've developed some new ideas that the boss said were good. I don't like to brag, but I know my stuff, if I do say it. But when a promotion comes along do I get it? Yes, I do; in the neck. That's where I get it. The fellow who was shoved up is all right, I suppose, but he hasn't been here as long as I have and I can't see where he gets off to ring in ahead of me. I'm plumb disgusted and I don't give a hang who knows it. Hard work for six years doesn't mean anything around here, but it's as plain as the nose on your face that if you've got enough pull you'll get somewhere — [*pauses for breath.*]

OLD-TIMER: Say Bill, where do you get your shaves?

BILL: [*Rubbing his fingers over his chin.*] Oh, I had to rush so this morning, I didn't have time to shave.

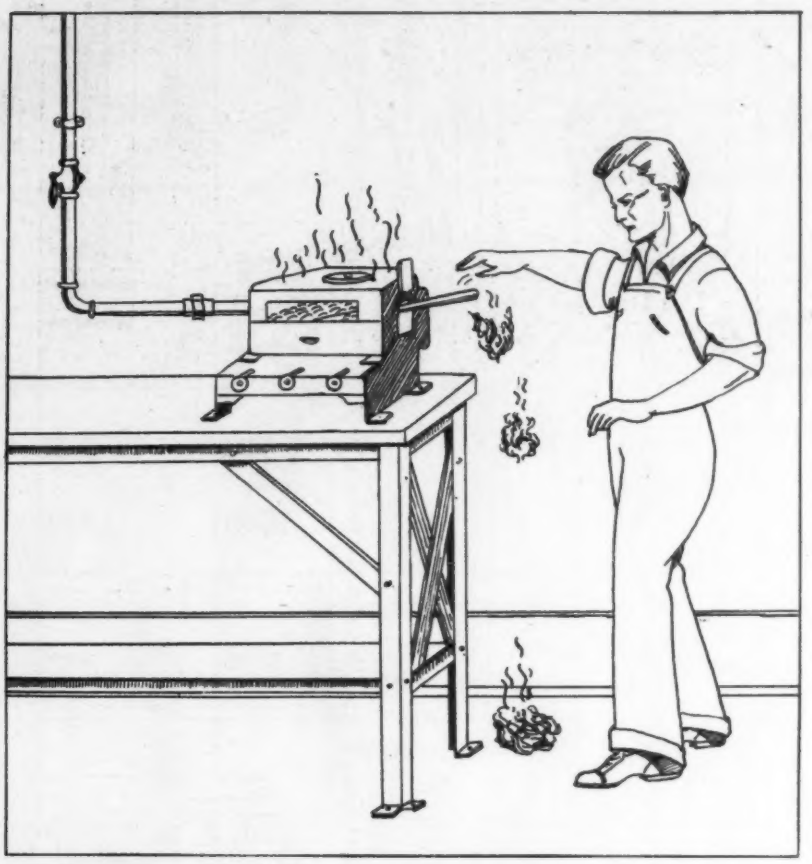
OLD-TIMER: Time H. . . ! I've been in this business thirty years, teacher first, then principal, and now director; and I've never left the house a single morning without a fresh shave. There's no such thing as, "didn't have time." (Curtain.)

*Director of Manual Training, Newark, New Jersey.

We should encourage the choice of a vocation at the earliest possible opportunity; any other course will only widen the gap between school and real life. — *L. S. Harding.*

The best form of vocational education is the trade-extension type which takes people already employed in a trade and carries them forward. People who have made up their minds as to what they want to do are those most easily trained. — *F. T. Struck.*

HOLDING HOT IRON WITH WASTE



Cotton waste is not a safe protection against burning your hands when handling hot iron.

It ignites with a flash and you may be painfully burned, or a dangerous fire may be started.

Wear asbestos or leather gloves when you have to handle hot iron.

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Submitted by Jos. J. Lukowitz, Milwaukee, Wis.

A FIRE HAZARD

Keep the blowtorch at a safe distance from woodwork, doors, and walls.

Its hot flame, when blowing against the plastered wall, may even ignite the laths or studs behind the plaster.

Take no chances.

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Submitted by Jos. J. Lukowitz, Milwaukee, Wis.

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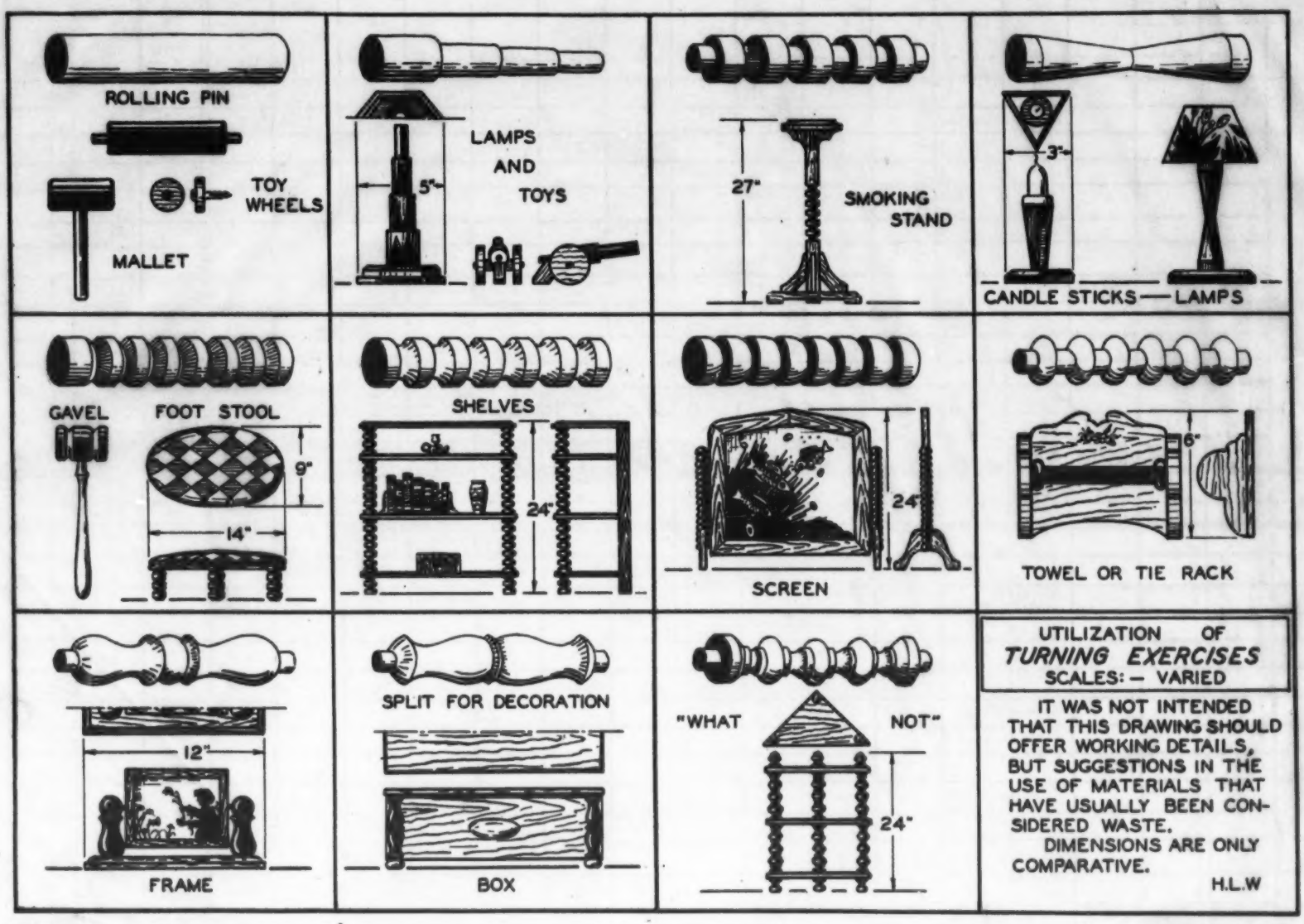

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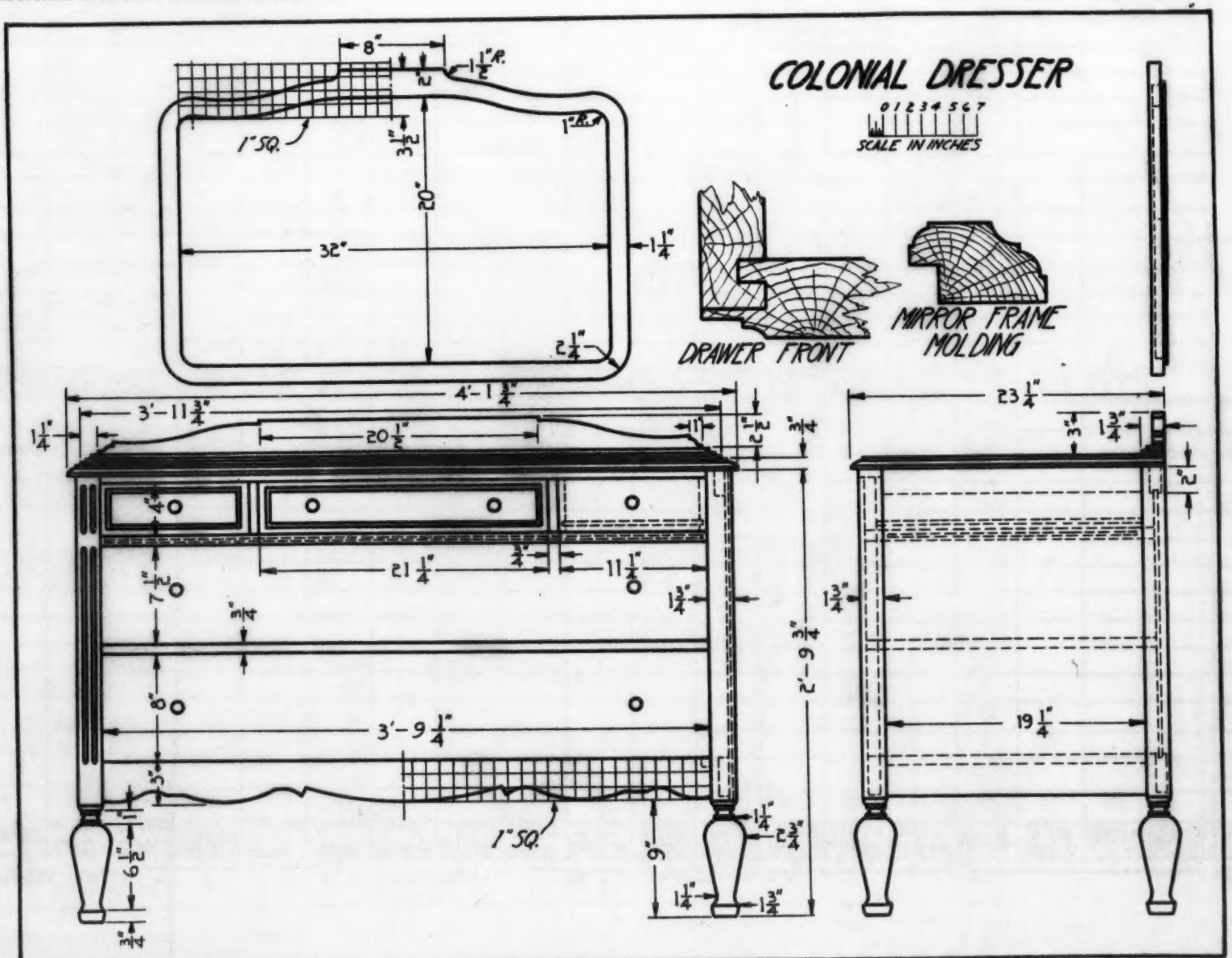
COLONIAL DRESSER



Designed by Lyle M. Garnett, Milwaukee, Wis.

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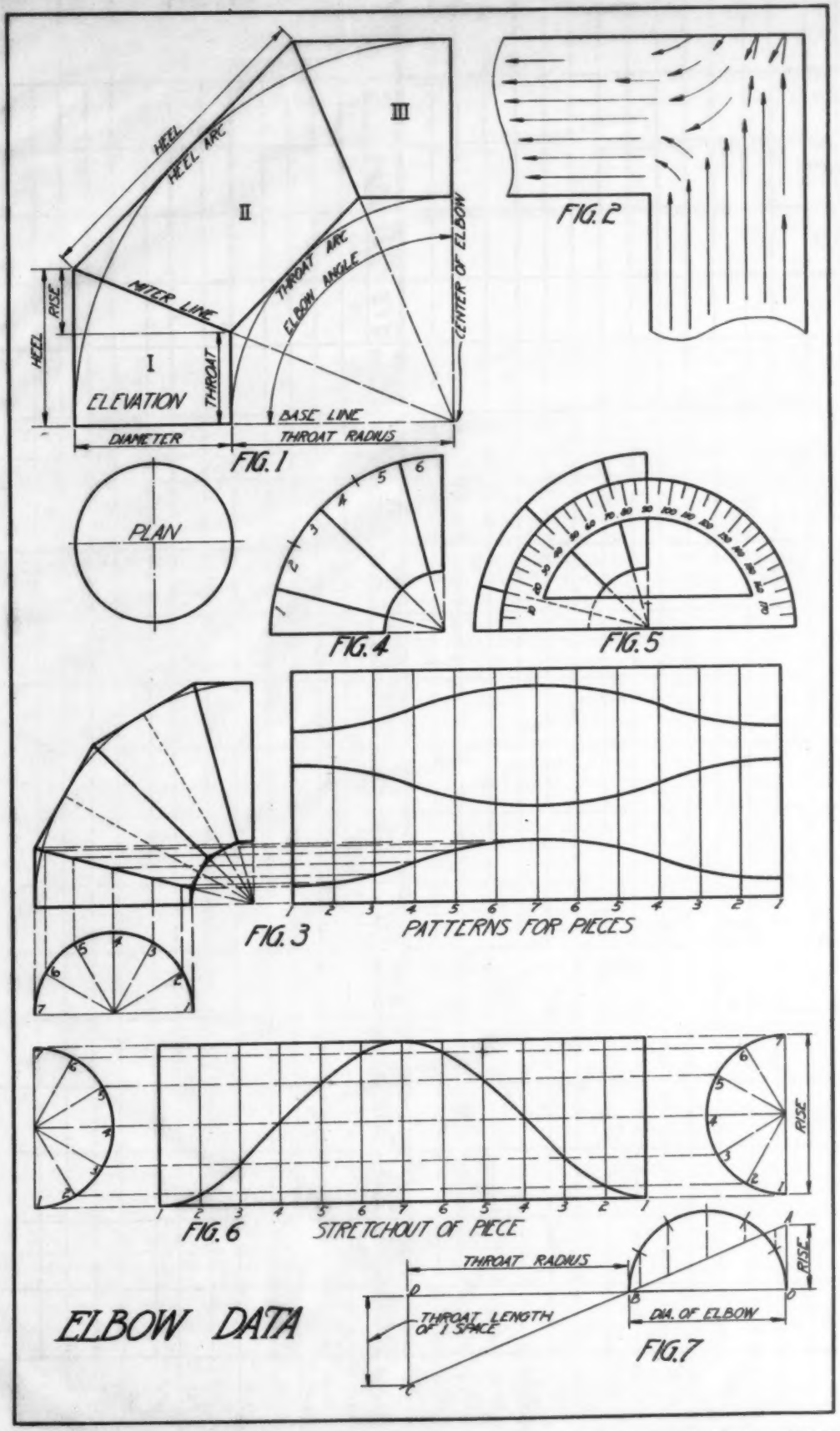

Designed by Lyle M. Garnett, Milwaukee, Wis.

Submitted by L. J. Schuerer, Manitowoc, Wis.

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TRACING SUPPLEMENT No. 232, JANUARY, 1932
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

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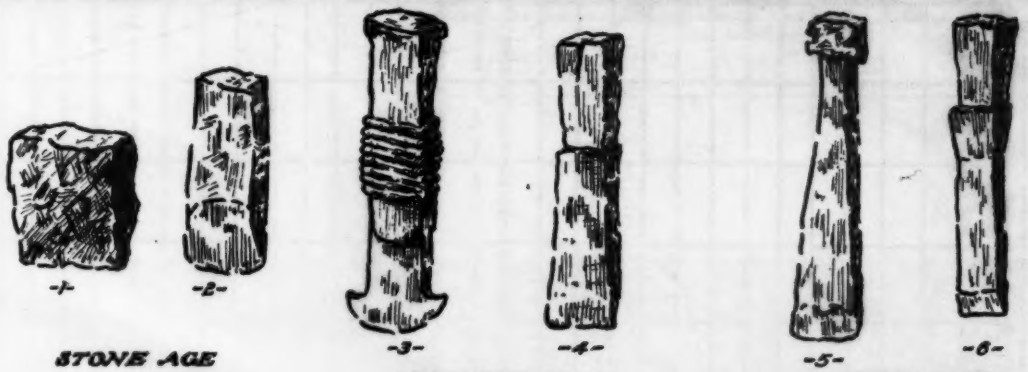
ELE. WOODWORK
CLIFFORD B. SMITH

STORY OF THE CHISEL

CLASS DEMONSTRATION SHEET — D-2



A QUICK INTELLIGENCE MOULDS NATURE TO ITS PURPOSE

PURPOSE — To trace the development of the chisel from its crude beginning:- to study its form, action and use.

THE LESSON — DEVELOPMENT :- A sharp stone, such as a piece of flint, was perhaps the first chisel. With the hammer it holds the distinction of being one of man's first tools. For thousands of years the one shown at -1- served its purpose. Man had at least recognized a cutting edge. At -2- he had reached the stage where he consciously chipped and scraped his tool to obtain the desired form. The world waited for the cutting edge. The instrument of the musician, the artist's canvass, the type of the author, all had their potential birth that day.

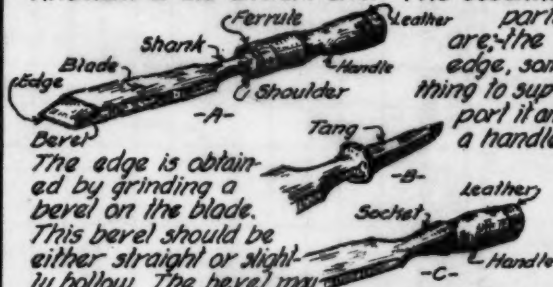
And then for many years man chipped, pounded and scraped with his stone tools, even as you and I would do to-day. Relatively few people by having lived change anything. They do well if they learn how to use and care for a tool, or master their work.

The mastery of fire made bronze possible. The ingenuity of man had a new field to explore. Handles made their appearance. Some gave hint of the tang, as we know it to-day. See sketch -3-. The casting of bronze gave rise to a new principle, the socket chisel, which is shown at -4-. The cutting edge improved in smoothness, durability and ease in forming, with the use of bronze.

The improvement in mankind's tools also spread to all phases of life. It diversified his activities and spurred on his yearning for finer and higher things. It made possible the glory of ancient Greece.

The Iron Age is the story of yesterday. At -5- and -6- we have samples of iron chisels. Iron's chief asset was perhaps its greater hardness. Add to this its variety of forms, viz., cast iron, wrought iron and finally steel, with its possibility of temper, case hardening and alloys. In this day, we still live on the threshold of the Age of Electricity. What new rebirth and awakening is about to down in letters, art and music?

FORM:- The modern chisel is only a refinement of the ancient one. The essential parts are:- the edge, something to support it and a handle.



The edge is obtained by grinding a bevel on the blade. This bevel should be either straight or slightly hollow. The bevel may be 20° for soft wood and 23 to 25° for hard. There are three classes of chisels;- paring, a light weight one, with beveled sides, for fine work;- firmer, slightly heavier, shown at -A;- mortising, a heavy socket chisel, (-C-) used in heavy construction work.

ACTION:- An edge by its keenness parts material in a definite direction. The bevel, like a wedge, tends to split the wood, removing the edge from cutting contact. See -D-. An edged tool can only act where the material is easily forced away. See -E-.

USE:- The purpose of this demonstration is not to go into detail on how to use a chisel. See WT-1. A chisel is used to rapidly remove surplus wood in working to a line, such as,- a curved edge, a mortise, etc. It can also be used to work very accurately and cleanly to most out of the way places.

QUESTIONS — What advantage has the socket chisel over the tang? What points are in favor of the tang? What effect does too much heat have on the temper in the blade of our tool? Did you know that the chisel prepared the way for every cutting tool? Why would you and I be just about as slow as the Stone Age savage to make improvements?

Designed by Clifford B. Smith, Buffalo, N. Y.

ADVERTISING PAGES REMOVED

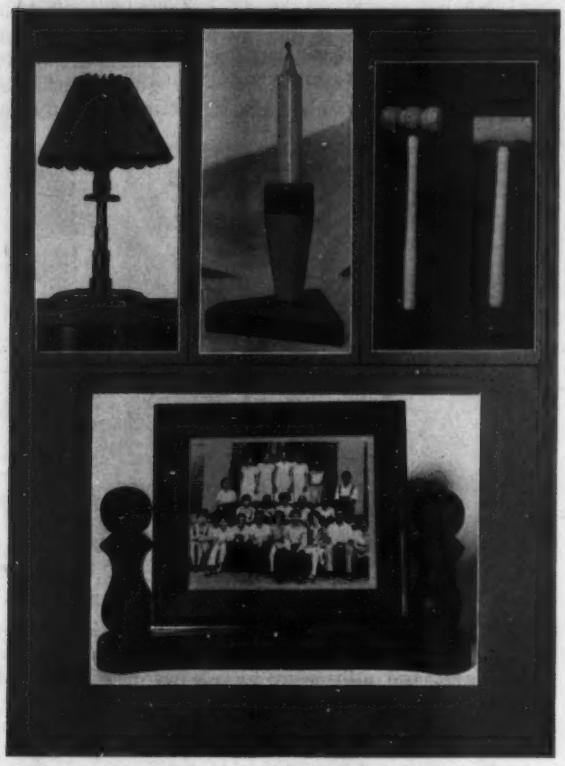
PROBLEMS & PROJECTS

UTILIZATION OF WOOD-TURNING EXERCISES

H. L. Weatherby, Lanier High School, Montgomery, Alabama

(See Supplement No. 229)

A chance remark made by one of the students while the spring shop cleaning was in progress, pointed a way to the utilization of turning exercises which heretofore had been



THE SIMPLER EXERCISES MAY BE USED FOR MAKING MALLETS AND GAVELS. OTHERS LEND THEMSELVES TO THE MAKING OF STANDARDS FOR PICTURE FRAMES, SHAVING MIRRORS, LAMPS, AND CANDLESTICKS

sent to the boiler room after having been graded. Prompted by this boy's suggestion to make use of the turning exercises in making other things, the question was put before the entire class and the accompanying illustrations show the uses for these turning exercises that were evolved.

DRESSER

Lyle M. Garnett, Milwaukee Vocational School, Milwaukee, Wisconsin

(See Supplement No. 230)

The dresser described in this article is a companion piece to the four-poster bed which appeared in the November, 1931, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. It would, however, make a very desirable individual project. It offers a wide variety of cabinet practice including the mortise-and tenon point, the dovetail joint, panel and drawer construction. It also offers the advanced student a chance to put into practice much that he has learned in his elementary courses.

The ends of the dresser ordinarily should be made of ¾-in. or ⅝-in. plywood. This material is not available in a great many school shops, whereas the ¼-in. plywood is. By running a crossrail inside the ¼-in. plywood to which this plywood should be glued, one will get the same effect as when using the thicker veneers. This type of construction is practically as strong as the other, too. A solid board should never be used for the end panel because of the expansion of the wood.

The drawers of the dresser should be made in the best possible manner. The rails between the drawers should be made in the form of a frame with a panel in the center. This is known as a "dust board" and serves to prevent the dust and dirt falling from one drawer to the other. In order to have a smooth-running drawer, make the drawer slightly smaller than the opening and provide some sort of guide below the bottom of the drawer. The drawer front, however, should fit the opening rather snugly but enough clearance should be allowed to provide for the several layers of varnish to be applied later. The drawer guide may be made by nailing a strip to the dust board and two small strips to the bottom of the drawer in such a way that one slides inside the other two. Another way of doing the same thing is to nail a small strip to the dust board and then make another strip with a groove cut into it that will slide freely over the single strip. This strip should be waxed or soaped for lubrication and then nailed to the underside of the drawer.

The drawer fronts have a shallow molding shaped on the three top drawers. This may be omitted if one wishes. The fluting on the legs may be done by hand where no shaper or router is available.

The mirror frame was roughed out and glued together before the molding was shaped on the edges. In this way one gets a continuous molding all around the frame.

The spline for the mitered corner should be far enough toward the back of the frame to clear the molding cutter or an unsightly job will result from the shaping process.

The rail across the front of the dresser at the top of the legs should be dovetailed to the legs. This prevents the legs from spreading apart at this point.

A good standard finish should be applied to the dresser. Special attention should be given the scraping and sanding process, as most students will want to slacken up on the work at this point.

ELBOW DATA

L. J. Schuerer, Manitowoc Vocational School, Manitowoc, Wisconsin

(See Supplement No. 231)

In designing and laying out elbows, it is necessary to become acquainted with the names of the various parts of the elbow. These are shown in Figure 1.

The diameter, throat radius, and number of pieces, are the three factors that must be considered in making elbows. The diameter is always first, and since this must fit with some other pipe work, it is generally always known. The throat radius and the number of pieces of an elbow may be varied to meet the conditions met in different cases.

Throat Radius. Elbows used with stovepipes, furnaces and duct work, and wherever a blast is not used are made with a small throat radius, usually one third the diameter of the elbow.

Pipes offer resistance to air, smoke, or gases that pass

through them. This also is true of elbows. Regardless of whether the flow is by gravity or is accelerated with a fan, the action of the air in a two-piece square elbow is as shown in Figure 2. For this reason, elbows used in making turns in grain conveyors, exhaust, and blow-piping work should be made with a large throat radius, as near as possible to two times the diameter of the elbow.

Pieces of an Elbow. Elbows are generally classed as being made of a certain number of pieces. The pieces are sometimes called gores or gore pieces and are shown at I, II, and III, in Figure 1. The two outer or end pieces I and III are half pieces and Part II is a full piece. The length of the end pieces I and III in furnace work is generally about two times the length of the throat for joining to pipes.

Finding the Miter Line (Method 1). Divide the angle of the elbow into a number of equal parts which is 1 less than the number of required pieces. See the dotted lines in Figure 3. Bisect these angles as shown by the heavy lines. These heavy lines will be the miter lines.

To lay out the miter cut on the stretchout, divide the circle in the plan into a number of equal parts, as shown by points 1 to 7. Project these points to the elevation until they intersect the miter line. Lay out the stretchout of the elbow using the same number of divisions as in the plan view and number the points. Project the points on the miter line in the elevation to the corresponding points on the stretchout.

Finding the Miter Line (Method 2). The middle pieces of an elbow having cuts on both edges, are twice as large as the end pieces which have miter cuts on only one edge, therefore each middle piece may be looked upon as occupying two spaces and each end piece, one space. Since then the 2 middle pieces take 4 spaces, and the 2 end pieces, 2 spaces, the total will be 6 spaces. Therefore, divide the heel arc, in Figure 4, into 6 spaces. Beginning from the base line, allow 1 space for the end piece and draw to the center of the elbow. This will be the miter line. For each middle piece allow 2 spaces and draw the miter lines. The stretchout is made as in Figure 3.

Finding the Miter Line (Method 3). In Figure 5 is shown another method of obtaining the miter line. As in Method 2 allow 2 spaces for each middle piece and 1 space for each end piece, thus obtaining a total of 6 spaces for 2 middle pieces and 2 end pieces. Divide the angle of the elbow into 6 equal parts, which in this case is 90 deg. divided by 6 equals 15 deg. Place a protractor on the base line as shown in Figure 5 and draw through the 15-deg. point, which will be the miter line. The stretchout may be obtained in the same manner as in Figure 3.

Finding the Miter Line (Method 4). Another method of finding the miter line is to find the rise. The rise in an elbow is equal to the difference in length between the heel and throat of an end piece.

For a 90-deg. elbow, 1 in. in diameter, the rises for elbows from 3 to 10 pieces are as follows:

Rises for a 1-in. Elbow

No. of Pieces	*Rise in Inches*	*No. of Pieces*	*Rise in Inches*
3	0.414	7	0.132
4	0.268	8	0.113
5	0.199	9	0.098
6	0.158	10	0.087

To find the rise for an elbow of any other diameter, multiply the rise given in the foregoing table by the diameter in inches of the desired elbow.

EXAMPLE:

To find the rise for a 5-piece, 12-in. elbow, multiply 0.199 by 12 which will be 2.378. Changing the decimal to a fraction of an inch equals 2 3/8 in. The miter cut on the stretchout may be obtained as in Figure 3.

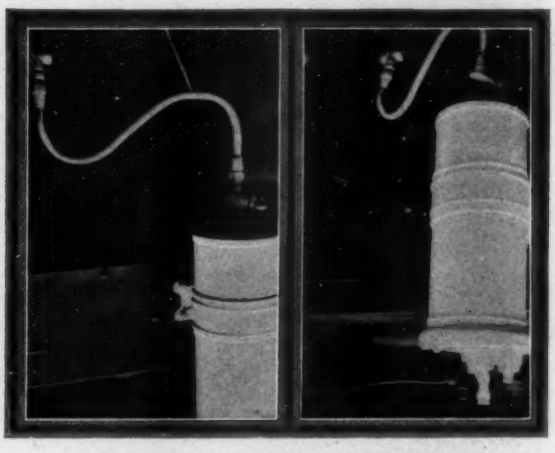
Miter cut on the stretchout. Another method of drawing the miter cut on the stretchout is illustrated in Figure 6. The diameters of the circles used in the layout are equal to the rise of the elbow.

Find the length of the throat. When the rise of an elbow is known the length of the throat may be found as shown in Figure 7. Extend the miter line AB, also the base line OB. From point B, on OB extended, measure the throat radius BD, and project from D a line downward until it intersects the miter line at C. DC is then the throat length of 1 space. The middle pieces of an elbow being 2 spaces the throat length is 2 times DC. The extra length allowed on the end pieces for joining to pipes is optional, and must be added to the throat length for 1 space.

A USE FOR OLD VACUUM TANKS

H. W. Paine, Associate Professor Vocational Education, The University of the City of Toledo, Toledo, Ohio

One of the most discouraging sounds in motordom is the warning "pop pop" from the carburetor of an automobile engine that is using the last few drops of gasoline from its gasoline tank. This sound is particularly disheartening if it occurs at night or several miles from the nearest means of supply. It is truly pathetic if both the above-mentioned conditions obtain. Since drivers with better memories are apparently not



THE RESERVE GASOLINE TANK INSTALLED

being developed, and since existing memory-training courses seem inadequate to cope with the situation, it occurred to the writer that one of the many discarded vacuum tanks could be pressed into service to provide a reserve supply of gasoline, which would enable the stranded driver to continue his journey to the nearest gas station.

All that is needed to apply this device is an old vacuum tank, a 1/8-in. tee, a 1/8-in. pipe nipple, a short piece of copper tubing, a compression coupling or two, and a shut-off valve at the bottom of the tank.

Preparatory to mounting this reserve tank, it should be disassembled, thoroughly cleaned, and all interior parts discarded, leaving only the outer shell with the cover. This reserve tank should now be mounted with its top 2 or 3 in. below the top of the regular vacuum supply tank so that the reserve tank may fill itself automatically. The shut-off valve is mounted at the bottom of the reserve tank while the tee is inserted between the carburetor and its regular feed line. The reserve tank is connected to the tee as shown in the illustration. To fill this tank, the valve in the bottom is opened and the engine is run slowly until the regular vacuum tank fills the reserve tank by gravity. The valve is then closed, trapping from 3 to 4 pints of gasoline, depending upon the size of the tank. This reserve supply is available at any time by simply reopening the shut-off cock at the bottom of the tank. It is sufficient to run the ordinary car from 8 to 10 miles which ordinarily is enough to reach a gas station or other source of supply.

In case the automobile is equipped with a fuel pump, the

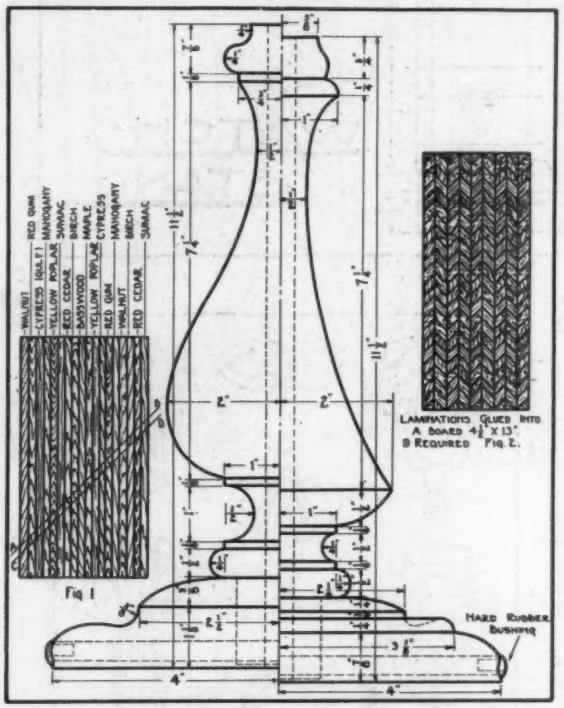
same procedure is followed with the exception that the height at which the reserve tank is located is immaterial except that it must, of course, be above the carburetor.

The entire operation of mounting this device will consume little time once the materials are collected and a suitable location for it has been found. In some installations it may be necessary to make a special bracket to accommodate the extra tank, but usually it will be found possible to mount it on the dash.

AN INTERESTING TABLE LAMP

W. I. Tawes, Claymont, Delaware

The table lamp described in this article requires more time than does a lamp turned out of plain stock. However, there are advantages in favor of the lamp glued up of small pieces of stock. In this lamp ½ by ¾-in. strips are needed, hence waste stock may be used. Then too, a lamp made up of several different kinds of wood of contrasting color, scattered helter-skelter, or methodically arranged throughout the stock, presents a unique effect which is quite striking. Of course, the



AN INTERESTING TABLE LAMP

contours shown are not new, but these curves cutting through the different woods produce an object that is quite odd and surprisingly charming.

The woods suggested in the illustration are suitable, but other woods of contrasting color may be used. All stock which make up the board shown in Figure 1 should be ¾ by ½ by 36 in. If the pieces are to be methodically arranged all pieces must be of the same thickness and glued up to form a board which when cut on an angle of 45 degrees would make strips as long as the lamp with a little allowed for waste, say about 13 in. ABCD, in Figure 1, represents a strip sawed from the board. The shorter lengths near the corner may be used when gluing up the base. The board is glued up ¾ in. thick, so that it may be jointed to ½ in. Enough boards should be glued up to make up the stock shown in Figure 2. This figure also shows how the laminations are to be arranged. Better results may be had by having all woods of a kind in the same zone—that is, the walnut pieces should go around the lamp and not be scattered unless a scattered effect is desired. If the latter is wanted, the woods should not be methodically arranged in the first board. The gluing-up of the pieces must be done carefully, with a good quality of hot glue. Heavy stresses are set up in the lamp because of varying expansions of the different woods. Unless the joints are strong enough to compress the molecules in the wood unequal expansion will result and the joints will open.

Turn the lamp according to the dimensions shown in the illustration, and after the cylinder has been formed, use a comparatively high speed and sharp tools, otherwise a rough job will result. The finish, of course, should be natural, with a French polish, if possible.

The top of the lamp shown is designed to receive the flange-type fixture. However, if the bushing type is desired, the top may be easily changed to suit. The hole in the center may be bored with an auger after the lamp is made, or a dado may be cut in the two central boards before gluing up the stock. A piece of heavy felt should be glued over the bottom of the base after the wiring has been done.

TO REMOVE THAT HAZARDOUS SLIVER

Charles M. Rice, North Junior High School,
Everett, Washington

Such a small thing as a sliver of wood or metal is dangerous to human life. Students should be trained to remove slivers from the flesh immediately. The delay of a few hours cou-

pled with proper conditions has often caused death. A ruling pen, having clean nibs, is a useful instrument for the removal of slivers, if a pair of tweezers is not handy.

USING ANIMAL GLUE TO CHIP GLASS

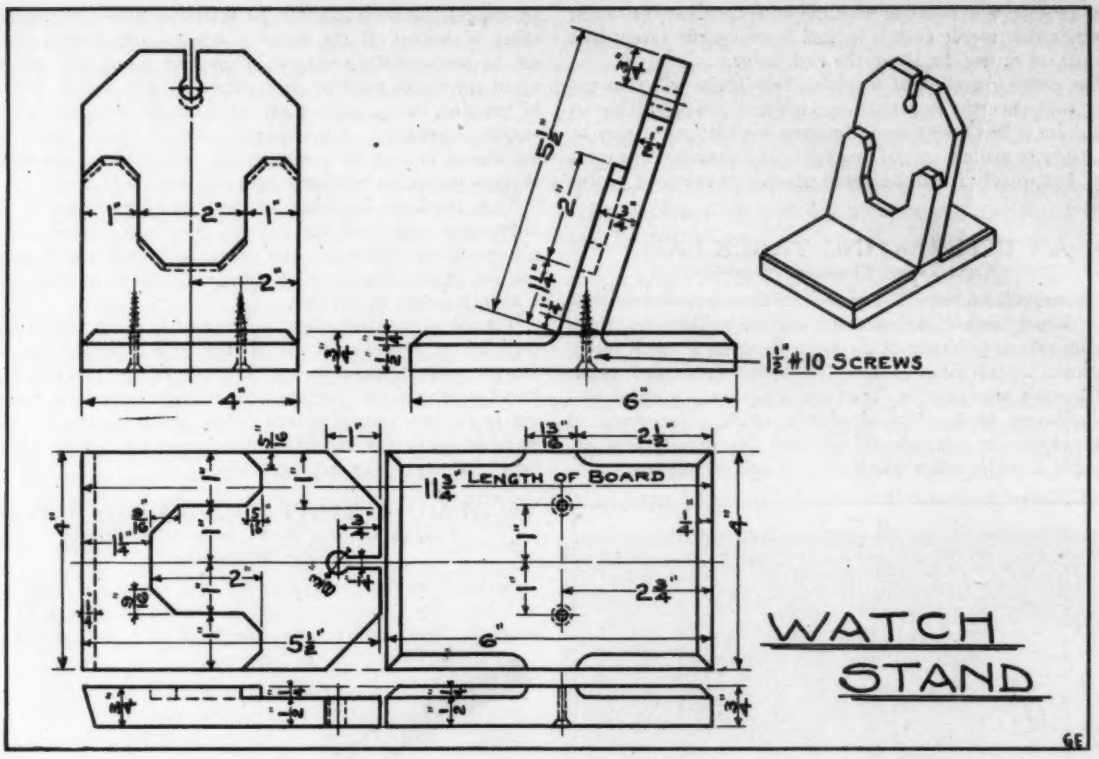
Nontransparent glass is frequently used in office partitions and doors. Its principal purpose is to permit the diffusion of light, and at the same time insure privacy in an office.

This nontransparent glass, which is known as "chipped glass," has the appearance of frosted glass. The method of manufacture is simple and effective. The pane of glass is first cleaned and made grease free. Next, a solution of animal glue is poured over the pane. As the glue dries, it shrinks, and since its adhesion to the glass materially exceeds the strength of the glass, chips of the latter pull away with it. These glue-covered chips, which come away like frost, leave their counterpart on the pane and give it the name of chipped glass. The resulting irregularity of the surface of the glass makes possible a diffusion of the light, but the glass is not transparent.

A WATCH STAND

H. D. Smith, Nyack, New York

The watch stand described herewith is a small article which makes a very good project for the seventh-grade industrial-arts class. It is composed of only two pieces of material, is simple in design, and yet has sufficient value to make a strong appeal to the boys. Its construction involves all of the basic tool processes required in the seventh-year work. The design may be made as easy or as difficult as the instructor may wish. The simple model shown in the sketch may well be the



minimum requirement and the more advanced students may be required to design their own top and base, or work out other designs which this simple sketch may suggest.

The finish, too, may be varied to suit the taste of student or teacher.

DESIGNS FOR PAPER KNIVES, FOBS, PENDANTS, AND PINS

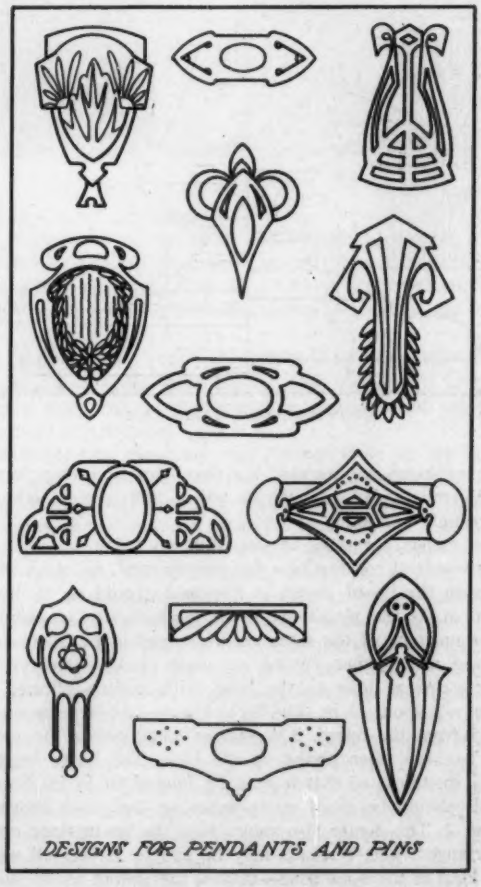
A. D. Sabin, High School, Bedford, Iowa

When taught properly, art-metal work is very interesting and fascinating to the average student. Many useful articles may be made. Some of the more simple articles are the paper knife, fobs, pendants, and pins. All of these may be made by the junior-high-school student, or by first-year high-school students.

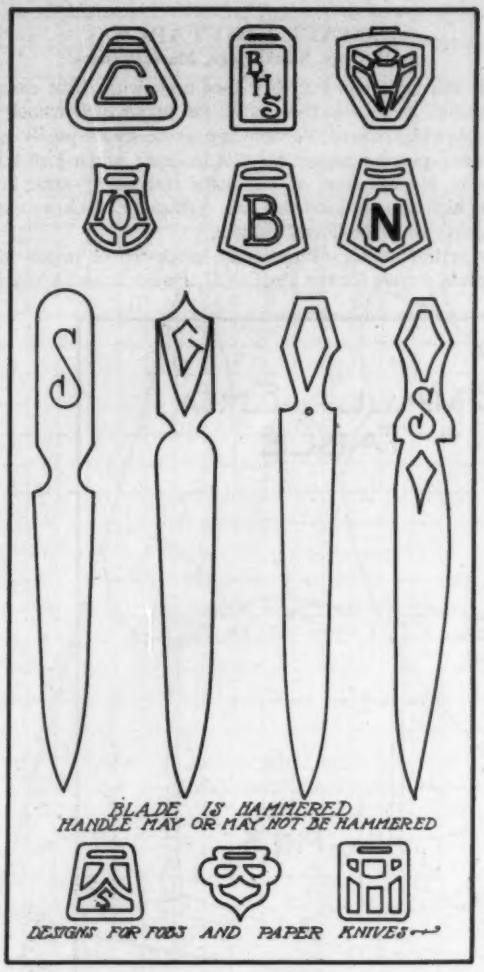
In making a paper knife, the design is first drawn on paper and cut out. This is then used as a template in transferring the outline of the knife to the metal. After the metal is cut, all rough edges must be filed smooth, after which it is hammered with a ball-peen hammer. Only the blade, or the entire knife may be hammered, depending on the type of design. If the handle is to be etched, it need not be hammered. For etching, the desired pattern is painted on the handle with asphaltum or colorite hat dye (gloss black). Any part which is to be etched is left bare. Allow the paint to dry for about half an hour, after which the entire knife is placed into a solution of one-third nitric acid and two-thirds water. The metal is left in this solution for an hour or more, depending on the strength of the acid and how deep the design is to be etched. The asphaltum or colorite may be removed readily with alcohol.

The process is applicable also for fobs, pins, and pendants.

Many of the designs of pins and pendants call for a new operation, namely that of cutting. When this is to be done, the pattern is traced on thin transparent paper and placed on the metal with glue or shellac. After this has dried, dents are placed in the metal with a pointed punch at places where there is a curve or angle of some sort. Holes are then drilled



DESIGNS FOR PENDANTS AND PINS



through the metal at these points with a No. 60 drill. The cutting is then started with a fairly fine jeweler's saw, say a No. 1. After the sawing is finished, all rough edges are taken off with a fine file. Usually three fine jeweler's files are needed for this; namely, a rat-tail, a half-round, and a flat file. After all edges have been smoothed, remove the remaining transparent paper on the pin or pendant with alcohol, if shellac was used to hold on the pattern, or water if glue was used. Now hammer and polish the project if this finish is desired.

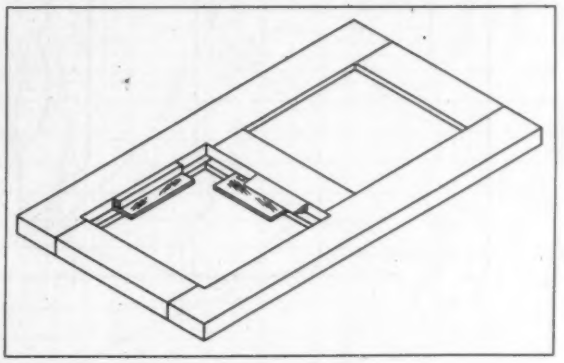
If the project is a pin, the bar and clasp must be soldered on the back. This is done with soft solder. The bar and clasp may be held in place with fine wire while soldering.

FRAME CONSTRUCTION

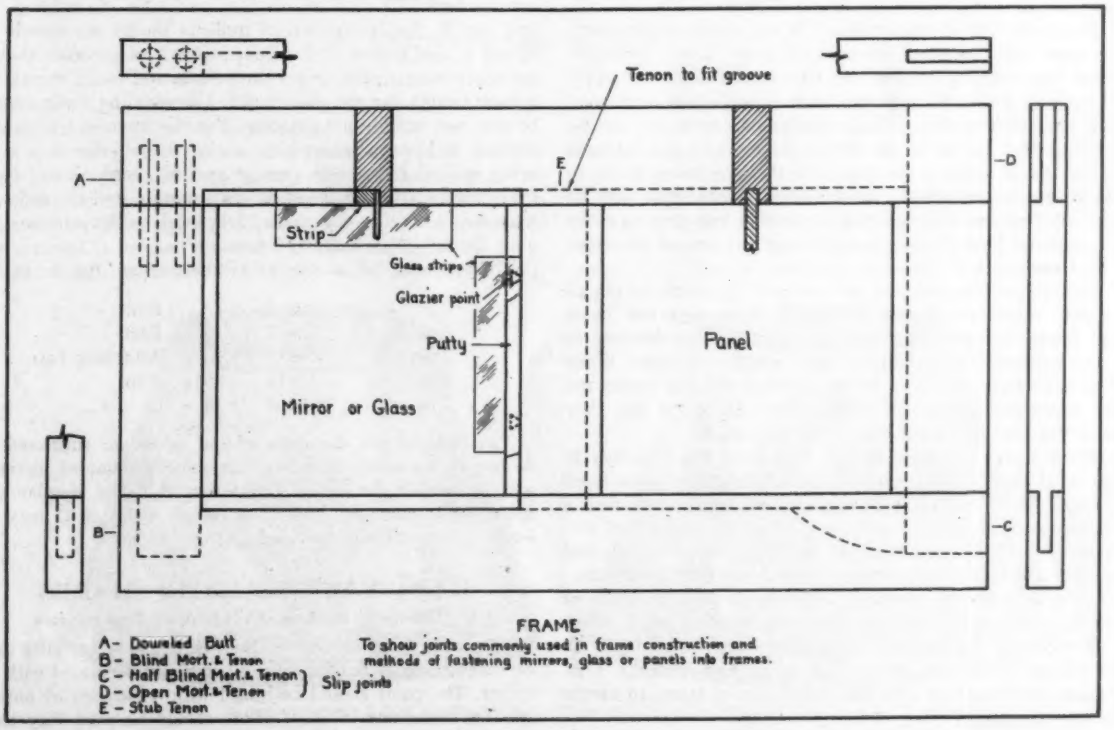
Frank W. Dejmel, Vocational School, Marinette, Wisconsin

The frame shown in the drawing illustrates five joints that may be used in frame construction and methods of setting a mirror, glass, or panel into a frame. When frame construction is being discussed, this sample frame will help to illustrate the different types of joints used.

A discussion of the merits of the various construction features will make it easier for the student to determine the



THE SAMPLE FRAME



type of construction that is best suited for the purpose of the frame he is about to make.

For example, let us consider a frame that will be exposed to weather. The glass should be fastened into the frame with glazier points and putty in order to seal all crevices. Joints should not be exposed as in the open and half-blind mortise-and-tenon joints (also known as slip joints). The blind mortise-and-tenon joint is preferred. The through mortise-and-tenon joint is also used, especially on frames that have only the surface exposed. There are many other points that may be brought into the discussion.

When the appearance of the edges and ends of frames, such as cupboard or cabinet doors, is not an important point, the open and half-blind mortise-and-tenon joints are used. These joints can be cut out with the circular saw very rapidly. It takes less time to make the two joints just mentioned than it does to make a blind mortise-and-tenon.

If the frame is to be used in a place where the strength of the frame is not important, then the stub tenon made to fit the groove, as shown on the center piece, may also be used on the ends. It requires considerably less time to make this type of joint than it does to make any one of the other joints mentioned.

The sample frame should not be glued. It should be placed so that students can take it apart and examine the joints and frame whenever necessary. Usually, students hesitate to make a project that requires a large number of joints. When they have an opportunity to examine a variety of joints and are shown how easily and rapidly they can be cut out, they have less fear of tackling a job of that kind.

When model joints are shown to students, they see merely joints. If they see the joints in actual use, they mean more to them. The frame should be taken apart to show the details of the joints and then assembled to show them in actual use. A small strip of glass fastened in with a wooden strip and another fastened in with glazier points and putty will illustrate two methods commonly used when setting glass or similar material into frames. In other opening put a panel.

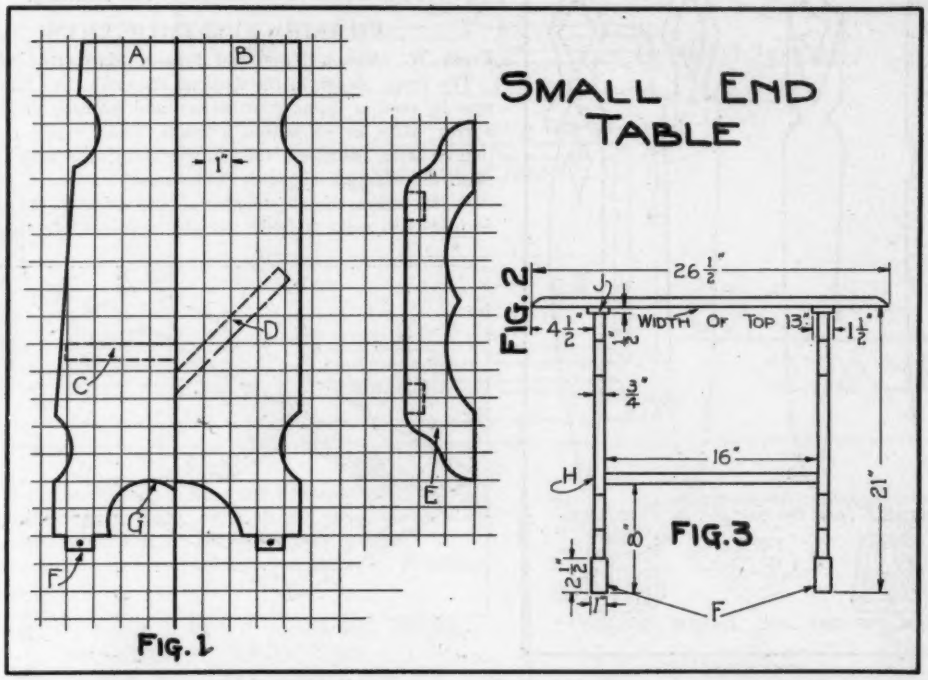
The over-all dimensions of the frame are ¾ by 10 by 18 in. All strips are 2 in. wide. This leaves two openings, 6 in. square. This makes a very convenient size of frame to handle in the classroom.

SMALL END TABLE

A. E. Gray, Stockbridge, Massachusetts

The end table herewith described may, with slight changes, be adapted to boys in the grades, the junior high school, and the senior high school. For instance, grade-school pupils might use white pine or poplar for this project; junior-high-school students, black walnut, or Philippine mahogany; while in the senior high school, quartered oak, mahogany, black walnut, or red gum, would be found suitable.

As to the matter of assembly, grade-school pupils might use r.h.b. screws for the shelf at H, Figure 3, and f.h. screws at J and F. Junior-high-school students should use dowels at H and F, and screws at J. Senior-high-school students should use mortise-and-tenon joints throughout and could substitute a book trough for the plain shelf. Likewise the finish would be that best suited to the student. For the grade boy, oil stain, shellac, and wax; junior-high, stain, shellac—the last coat being rubbed down with pumice and oil; senior-high, stain, filler, shellac, varnish, finishing with pumice and oil and rottenstone. Also, for any grade, delightful results can be had with the new "quick-drying" enamels.



The following bill of lumber will be required for the table:

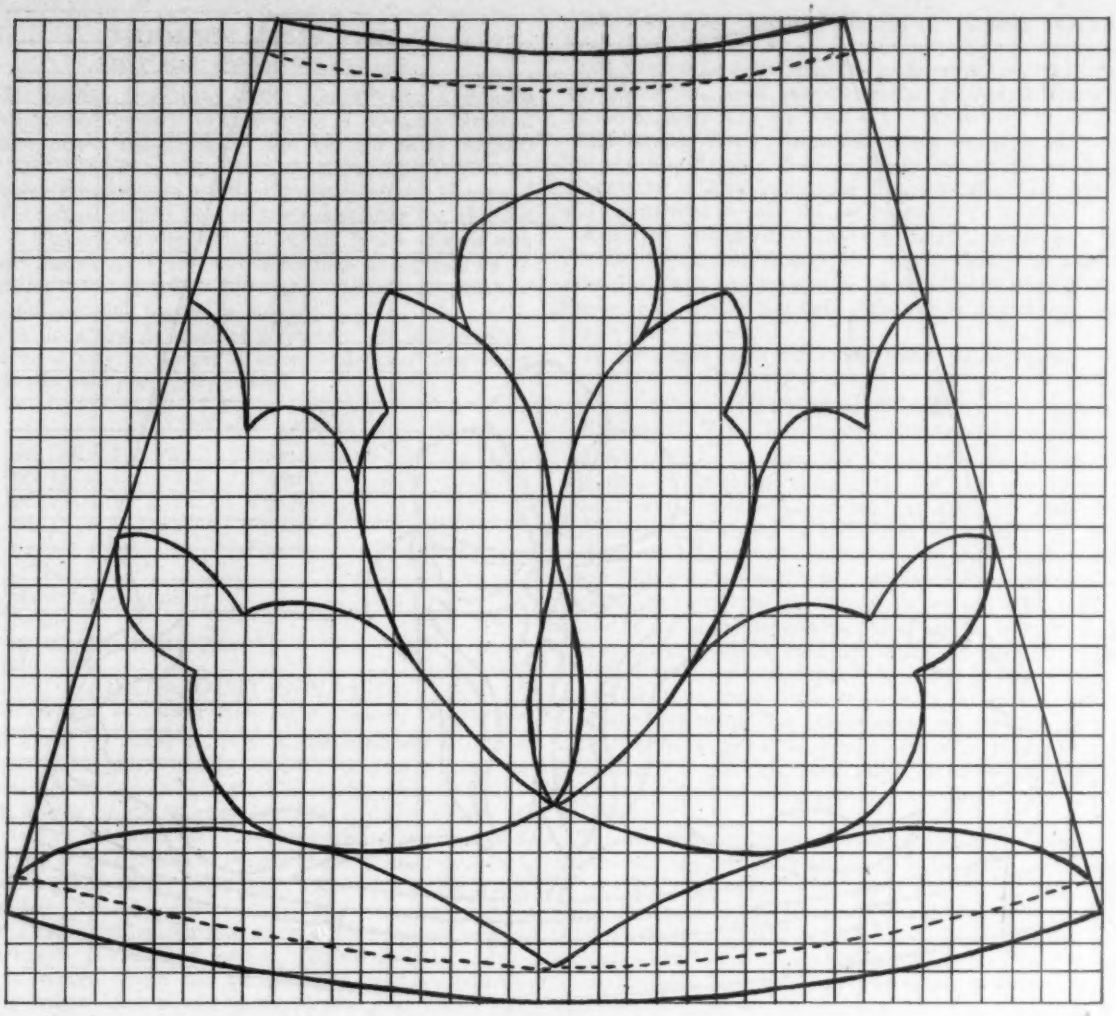
2 pc.	¾ (or 5/8)	x 9	x 18	Ends
2 pc.	1	x 2½	x 13	Feet
2 pc.	½	x 1½	x 10	Attaching Top
1 pc.	¾	x 13	x 26½	Top
1 pc.	¾	x 8	x 16	

Two designs for the ends of the table are suggested at A and B, Figure 1. However, the same amount of material will be needed for either. Suggestion B is the simpler and more easily executed. The book trough noted at D may be built in, regardless of the choice of end design.

HAND-PAINTED LAMP SHADES

D. Elizabeth Roberts, Philadelphia, Pennsylvania

Attractive lamp shades for one's own use or for gifts may be easily made of parchmentized paper and decorated with oil colors. The paint should be mixed with a medium of linseed oil and turpentine. The oil colors should be used very thin,



HAND-PAINTED LAMP SHADE, DESIGN NO. 1

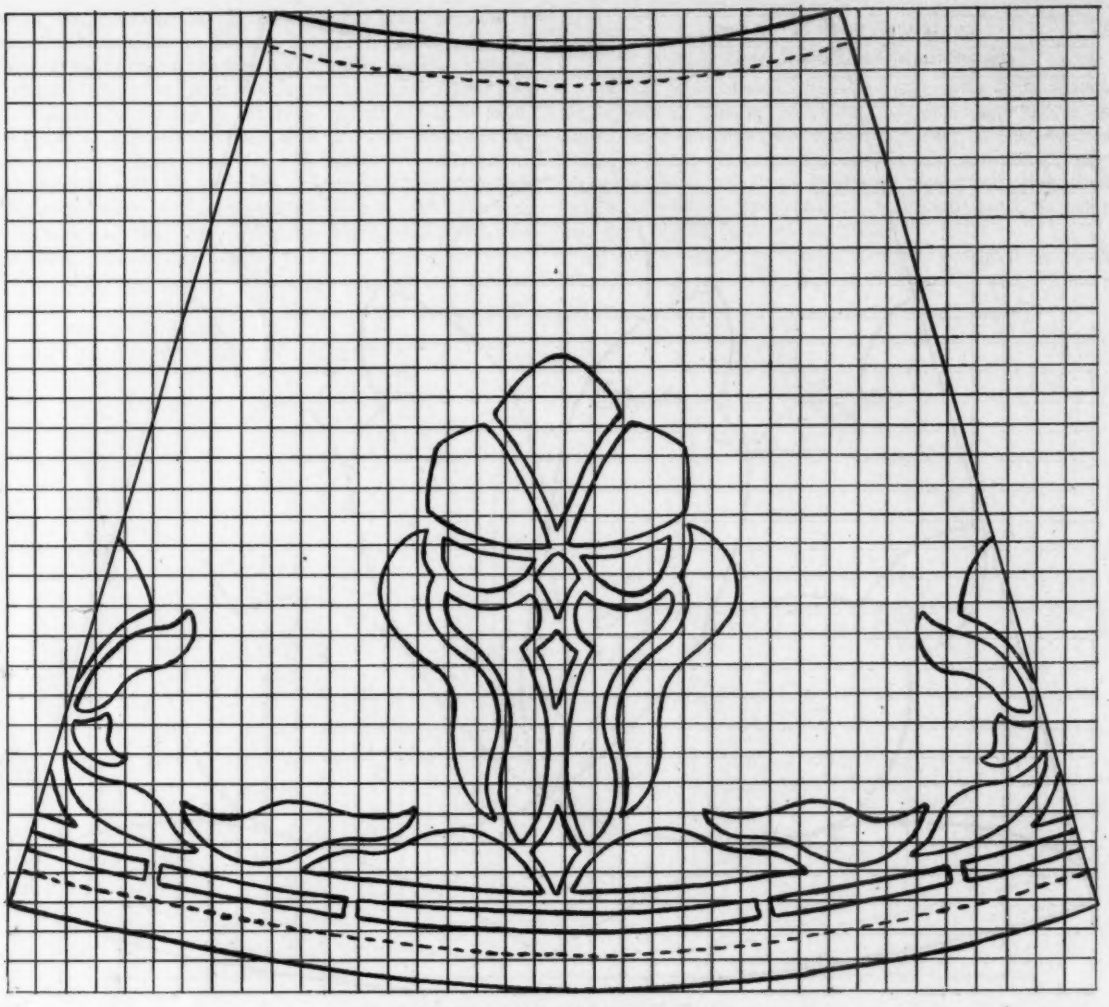
putting on more than one coat if necessary, allowing each coat to dry thoroughly before applying the next.

The circular top of the shades illustrated is 6 in. in diameter and the lower circle is 12 in. in diameter. The design is repeated four times around the shade, and an extra half inch is allowed for overlapping. Both designs may be easily reduced or enlarged to be used on shades of other dimensions.

The design for shade No. 1 may be used as a stencil or it may be transferred to the paper and painted directly on the shade. Rose for the lightest parts and two shades of green for the darker portions are good colors for this shade, though other color schemes would be equally attractive.

The design for shade No. 2 should be transferred by means of carbon paper to the shade, making the lines as light as possible. Yellow for the lighter parts, orange for the medium, and green for the darkest makes an attractive color scheme.

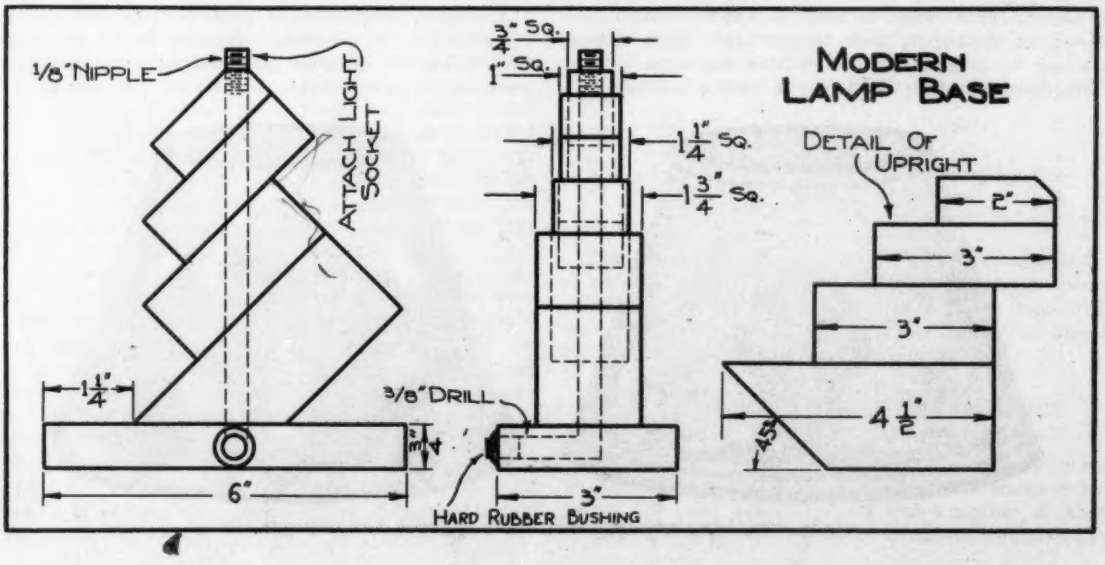
HAND-PAINTED LAMP SHADES, D. ELIZABETH ROBERTS, PHILADELPHIA, PA.



HAND-PAINTED LAMP SHADE, DESIGN NO. 2

A wire frame should be used as a foundation for the paper shade. Fit the parchment over the frame and join together by a narrow strip of leather laced through holes punched along the edges of the shade. If preferred, the shade may be joined to the frame by small stitches. The edges may then be covered with braid or a thin leather binding.

To make the shade more serviceable, so that the surface may be washed, give it a thin coat of white shellac.



MODERN LAMP BASE

R. P. Bell, Chester, Pennsylvania

The modern lamp base in the accompanying illustration is an excellent project for making use of the scrap pieces of walnut, maple, and mahogany. The fact that all of the parts are held together by glue, furnishes an excellent project for teaching the correct method of gluing.

The hole is drilled through the pieces after the glue has dried. The original was made of walnut. It was finished with boiled linseed oil. A very nice effect may be obtained by alternating blocks of walnut and maple. The lamp also may be made of pine and finished in lacquer.

The shade may be made of parchment with a modern design, or it may be bought at some department store where large selections are usually offered.

Bill of Material

1 pc. ¾ x 3 x 6	Base
1 pc. 1¾ x 1¼ x 4½	Upright
1 pc. 1¼ x 1¼ x 3	Upright
1 pc. 1 x 1 x 3	Upright
1 pc. ¾ x ¾ x 2	Upright
1⅛" Nipple	
1 Hard-Rubber Bushing	
1 Socket	
Wire and Attachment Plug	

GLUE-JOINT SCRAPER

F. N. Newton, Jr., Senior High School, Sharon, Pennsylvania

In gluing up pieces of wood in the woodshop, a certain amount of the glue is usually squeezed out from between the pieces and dries on the outside. The scraper, described herewith, is very handy for removing these particles of glue or any foreign substance that may have adhered to the wood. The tool is also handy to remove particles from round or square corners, and there are other uses for this tool in the woodshop.

It is easily and inexpensively made and will furnish various departments of the school shop with a good project.

The wooden handle may be turned up in the woodshop.

The scraper blade should be forged of a good quality tool steel in the forge shop, and the rest of the work is a machine-shop problem.

The copper or brass ferrule may be made out of tubing and filed with a slight taper in the bore so when it is driven on the handle it will stay on.

The scraper should be filed smooth on both sides and then the edge may be ground on the emery wheel, after which it is ready to be filed and stoned. The hole should be drilled and countersunk to take the copper rod.

After the various parts have been assembled, the ends of the rod which goes through the handle should be peened over. The copper washer should be placed on the end of the handle so that when the end of the rod is peened over the handle will not crack.

As a finishing touch the handle should be shellacked.

A COVERED WAGON

Frederick T. Dacey, High School, Agawam, Massachusetts

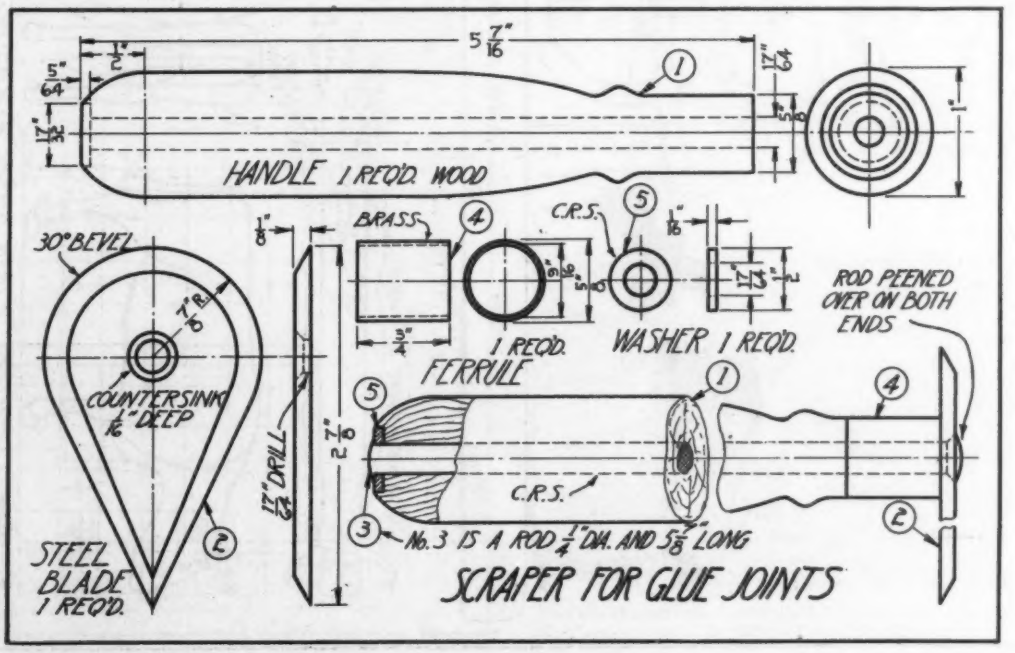
There could be no more fitting time than the present to reproduce an old prairie schooner, as last year was the centennial of the covered-wagon era. On April 10, 1830, the first wagon train started its heroic trek westward.

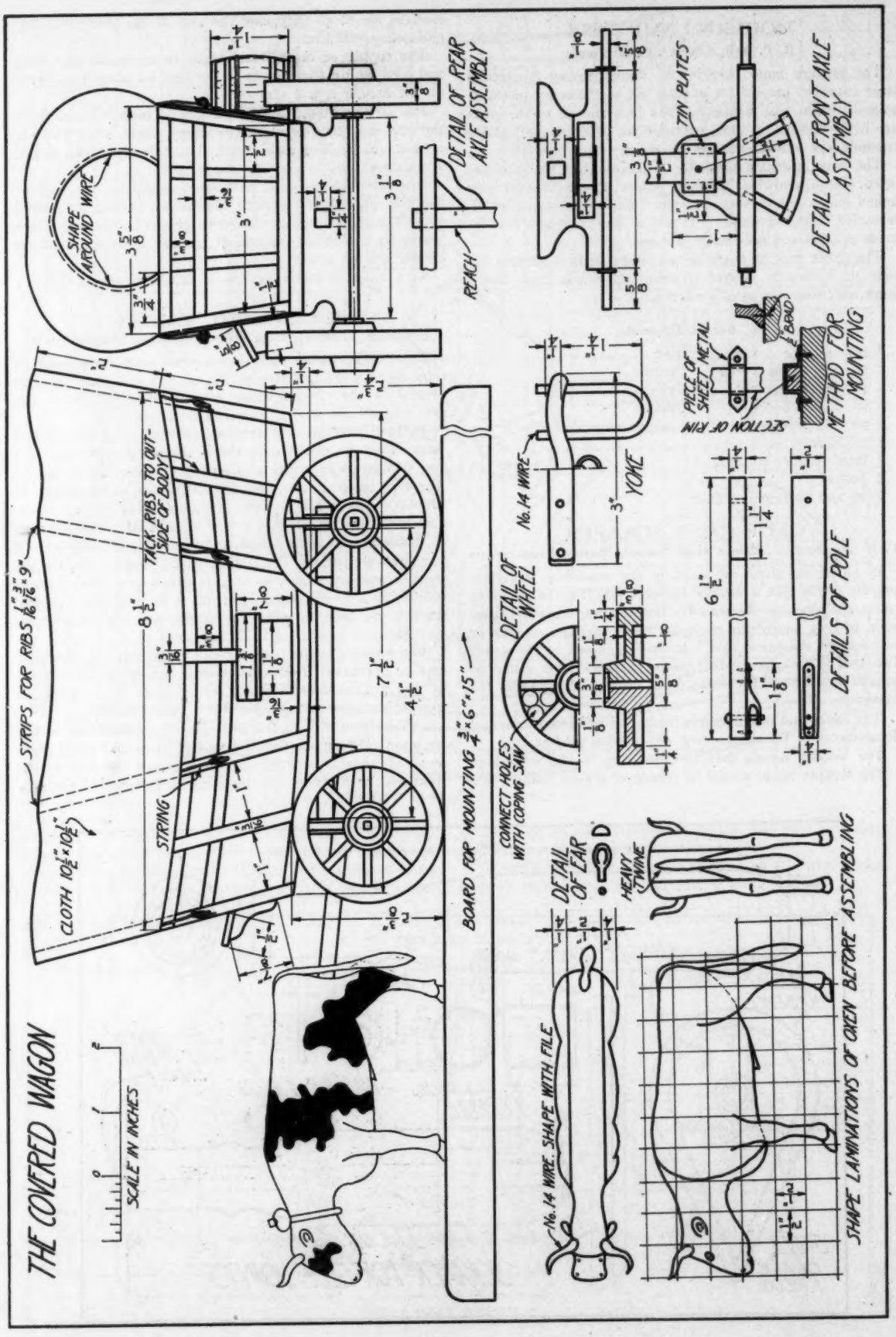
These picturesque old vehicles were of many shapes and sizes. The one depicted in the accompanying drawing was one popular type called a "Conestoga wagon." This particular type varied in size, and the model may be lengthened in proportion as yokes of oxen are added. The general shape should be kept, however, for it is an authentic reproduction.

The details are quite simple and may be understood readily from the illustration. The author would suggest that the instructor make a model, to arrange progressive steps, before submitting it to the class. Since this is an ornamental model, there is no need to make the wheels and the other parts movable.

The wheels are the most difficult individual job, but they may be purchased from firms dealing in supplies for models. If they are to be made in the school shop, birch, maple, or some other hard, close-grained wood should be used.

Unbleached cotton is the best type of cloth to use for the tarpaulin. The author folded over the edges and glued them to accommodate the string on the sides and the wire on the front and back. When the tarpaulin is fastened in place, it




THE COVERED WAGON
SCALE IN INCHES
STRIPS FOR RIBS
CLOTH
STRING
TACK RIBS TO OUTSIDE OF BODY
SHAPE AROUND WIRE
REACH
DETAIL OF REAR AXLE ASSEMBLY
BOARD FOR MOUNTING
DETAIL OF WHEEL
CONNECT HOLES WITH COPING SAW
No. 14 WIRE
YOKE
TIN PLATES
DETAIL OF FRONT AXLE ASSEMBLY
PIECE OF SHEET METAL
SECTION OF RIM
METHOD FOR MOUNTING
DETAILS OF POLE
DETAIL OF EAR
HEAVY TWINE
No. 14 WIRE. SHAPE WITH FILE
SHAPE LAMINATIONS OF OXEN BEFORE ASSEMBLING

should be given a thin coat of white shellac. This tends to make it stiff and it will hold its shape.

The lower panels of the wagon body should be painted dull blue and the upper ones red. The braces, wheels, and remainder of the wagon should be stained *weathered oak*, or a similar color to give the wagon an aged appearance. All metal parts should be painted a dead black.

The model requires careful work, but it is not too difficult. When completed, it will be an ornament of value, as these models are gaining favor especially in inland communities where people have little interest in boats.

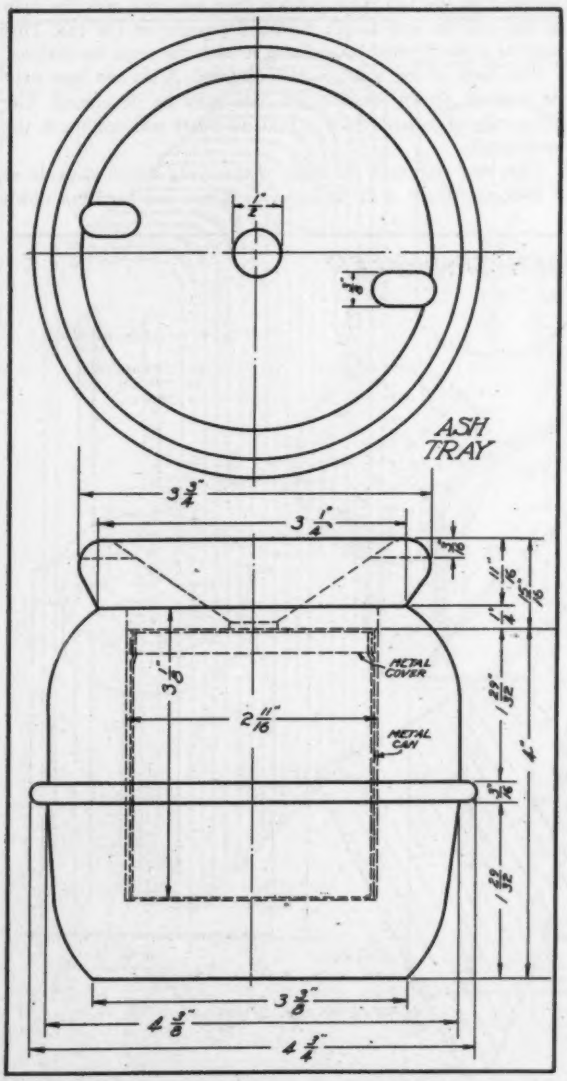
ASH TRAY

Alfred H. Wellman, French Junior High School, Lansing, Michigan

The ash tray described herein was designed to get away from the customary lamps, candlesticks, etc., usually selected as wood-turning projects by boys of junior-high-school age.

By using a 4-in. faceplate the wood may be fastened directly to the plate. However, if a larger faceplate is used it is necessary to first glue a larger piece of 1-in. stock to the block, with a piece of paper glued between the two pieces, and then fasten this larger piece to the faceplate.

Black walnut was found to present the most pleasing finished appearance, although a block glued up of alternating strips of walnut and maple also finished up well.



Fasten a block, 4 by 5½ by 5½ in., to the faceplate, and put it in the lathe. Revolve it by hand, at the same time scribing a pencil line on the face of the block to form a circle 5 in. in diameter. Remove the block from lathe and saw the corners off, sawing just outside the pencil line. The block is then ready for turning. Turn the outside design first. It will be found to give much support to the piece if the dead center is run against the block while shaping. After the shaping is done, run the center back and remove the inside material. The accompanying illustration shows this cut so as to receive a small tin can. However, the size may be altered to suit whatever tin can is available.

The cover is then turned. This is done by gluing a piece of stock to a separate piece as mentioned before, and then fastening the two to the faceplate. A ½-in. hole is cut through the center of the top, and the cigar rests are then cut in, each slightly off center.

The cover is turned so as to form a tray, and turns down to about 1/16-in. thick at the hole. A ¼-in. hole is cut through the metal cover.

In both the bowl and the cover all sanding and finishing is done before the piece is removed from the faceplate.

It will be noticed that the inside of the bowl is cut ¼ in. deeper than the depth of the can. This is to accommodate the cover setting in a short distance. The metal can is provided with a metal cover so as to form an all-metal inclosure for burning tobacco.

A tray of this sort will be found a welcome addition to any man's smoking equipment. Cigaret butts may be dropped, lighted, into it and are immediately choked out, thus doing away with the evil-smelling butt, as well as the unsightly open ash tray.

Although the design shown in the drawing was found to present the best appearance, many other designs were used.

MINIATURE AIRCRAFT PROPELLERS

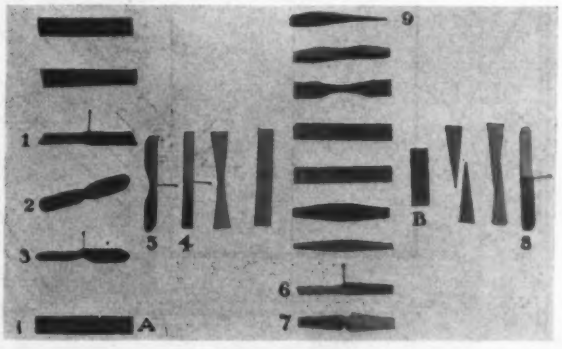
Terence Vincent, Kansas City, Missouri

A few years of experimentation with propellers for rubber-powered skycraft has demonstrated that any softwood block, the thickness of which is half its width, and the length of which is five times the width, can be made into a variety of propellers, each doing different work. The finished propeller should not weigh more than one sixth of the entire flying machine, and it may be as much lighter as possible.

M.A.F.[1] Propeller

The M.A.F. propeller specially designed so that it can be produced quickly is No. 1 in Figure 1. It requires just four cuts on the block of wood to make this propeller ready for the shaft, beads, and cement.

[1]Miniature Aircraft Fliers.



PROPELLERS FOR MINIATURE AIRCRAFT. PHOTO BY DR. HOWARD C. ATWOOD

No. 2 shows this same propeller, but with the tips rounded, and the hub cut out on the edges (not the sides). This makes the propeller lighter and more effective than No. 1.

No. 3 shows a further refinement. On this propeller the hub is reduced in thickness on one side.

Further refinements may be made on these three variations of the M.A.F. propeller, by making the blades as thin as possible, consistent with the work each is called on to perform. A light propeller should work on a light airplane, while a heavy-motored skycraft should have a strong and rather heavy propeller.

No. 4 shows a propeller made from the same sized block, but with the width narrowed at the center.

No. 5 is cut from No. 4 as shown. It may be made very efficient by shaping the cross section of the blades like a wing section. Only skilled woodworkers, guided by aërodynamic information, can do this. Boys, however, often achieve remarkable results, although they may not know exactly what they are doing aërodynamically.

Another variation of the original block A is the Rogers propeller shown at No. 6, in which the block was beveled down on both edges and one side. No. 7 was beveled down on all edges and sides, then cut like No. 1. The tips of the blade may be rounded or pointed, if desired.

No. 8 shows another very efficient type which is called the Lahann. Where economy of wood is desired, this is the best method of making a propeller. The cross section of the block B used for this propeller is the same as in the other instances, its length, however, is five eighths of the length of the finished propeller. The block is first cut into two triangular pieces. These are then cemented together at the ends, with the end of the shaft in place. After the cement has dried the propeller may be finished like any other.

No. 9 shows a very efficient propeller devised by one of the efficient skycraft fliers in California. The side of the block is divided into fourths, and the two inner fourths cut out much as for propeller No. 4. The top of the end fourths are cut down to half the thickness of the block. Then this propeller is carved as the others were carved.

Interesting experiments may be made by dividing the block into sixths, or eighths, cutting the end sections down a sixth or an eighth of the thickness, and by cutting down the edges of the middle two portions near the center hole.

TIN-CAN GARDEN SPRINKLER

Nicholas R. De Cesare, Baltimore, Maryland

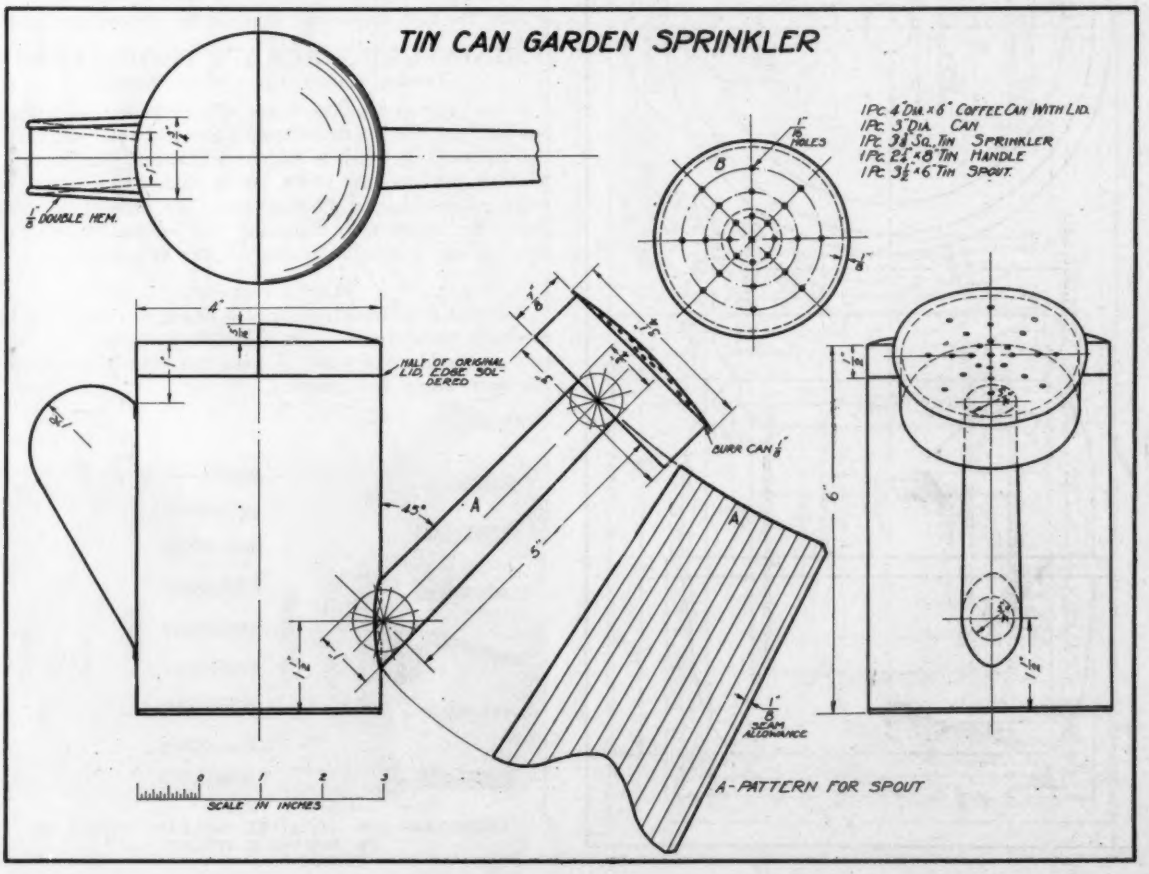
The body of this sprinkler is made of a can that is 4 in. in diameter and 6 in. high. A larger-sized can may also be used. This project contains enough operations of sufficient difficulty to be given to seventh- and eighth-grade pupils.

To prevent water from spilling out of the top when tilted, the can is half covered with the original lid. This lid is first raised on the round-head stake and then cut in half with the snips. It is then soldered in place.

The spout is shown slightly tapered in the drawing, but if the instructor wishes to make the task easier, it may be made straight. It is formed over the horn of the creasing stake, or over a piece of dowel rod. A ¾-in. hole is punched into the can opposite the seam. This should be done before the lid is soldered on the top. The spout is then soldered over the hole in the can. Be sure to get it placed straight on the can. This may be accomplished by sighting it with the seam on the can.

The form of the spray is also optional. A tin-can base may be used as shown, or a flared base may be developed. The advantage of a flared base is that no water will remain in the sprayhead.

This way to attach the base of the spray which is made of a milk can about 3 in. in diameter which has been cut down



to a height of 1 in., is to punch a ¾-in. hole in the center of the can and solder it to the spout. Burr over the top edge of this can about ⅛ in. before soldering it. The top of the spray should be laid out on a sheet of tin 3¼ by 3¼ in., with dividers and scratch awl. The holes are punched with a 1/16-in. solid punch. This perforated top should be raised slightly and then soldered to the base of the sprayhead.

A simple question-mark handle should be soldered at the seam to the body of the can, supplemented if desired, by a circular handle over the top, and fastened to each side. This additional handle, however, is not shown. If the two suggested are not desired, one which is simple and economical is a curved handle about 1 in. wide with a ⅛-in. double hem, running from front to the back of the can.

The projects should be enameled in bright colors decorated by simple flower stencils.

A HUMIDIFIER

H. M. Anderson, J. Sterling Morton High School, Cicero, Illinois

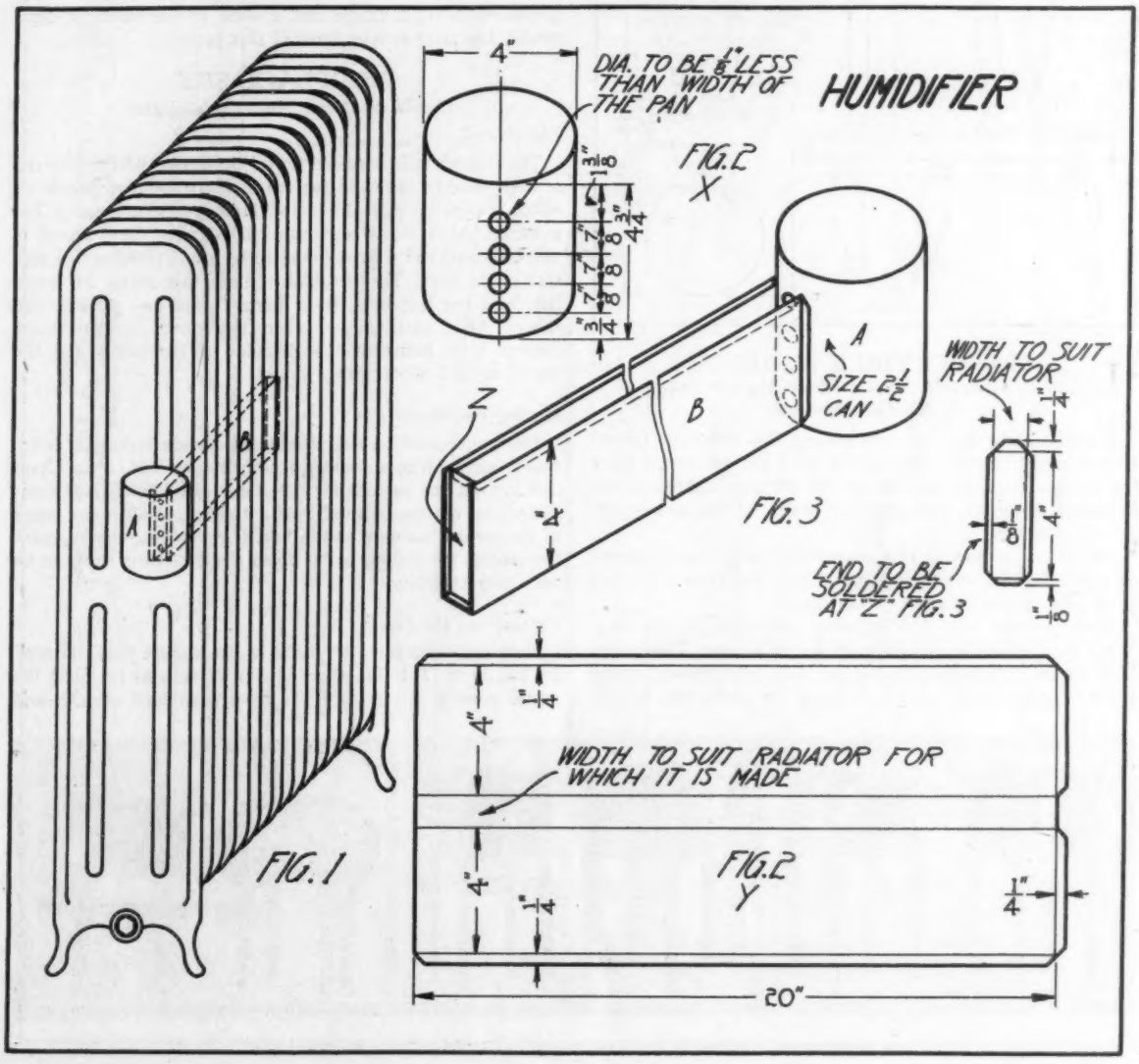
As the winter months approach, a humidifier for steam or hot-water radiators may be selected as a problem for the sheet-metal or general-metal shop.

The humidifier described herewith has become very popular with the students and may be used as an early problem in the beginning class. The humidifier consists of a metal can A, Figure 1, and a deep, narrow pan B. Part B of the humidifier must fit into the end openings in the radiator coils. Hence, those students who intend to make one must take measurements on the radiators at home and present a sketch of the problem with the dimensions on it.

Part A is made from a tin can also brought from home, this to be no smaller than a No. 2½ can. Locate a line from top to bottom of the can and drill or punch a series of holes which are ⅛ in. less in diameter than the inside dimension of pan B (see X, Fig. 2).

Part B is made of No. 26 galvanized iron. This pan is about 4 in. deep and wide enough to slide easily into position between the radiator coils. The top edges of the pan are finished off with a ¼-in. hem. The layout of this part is shown at Y, Figure 2. After the sides have been formed in a cornice brake, a piece is cut to fit snugly in the end as shown at Z, Figure 3. This piece is soldered in place after which the can and the pan may be assembled, all joints being soldered water-tight. It is then ready to be tested for leaks.

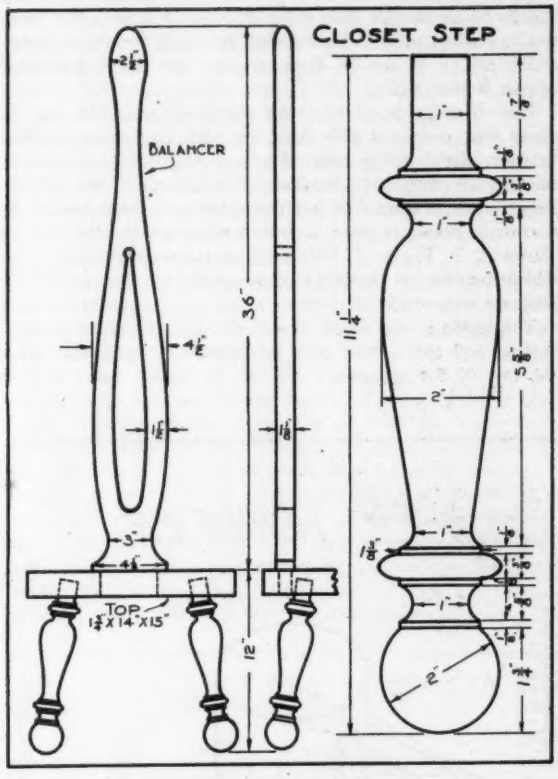
The inside of the whole should then be painted to prevent rusting and the outside may be finished to harmonize with the rest of the radiator.



THE CLOSET STEP

R. M. Hammes, Abraham Lincoln High School,
Council Bluffs, Iowa

With this one-step-up you can reach that just-too-high closet shelf. It also serves as a stand for traveling bag, or may be used as a convenience in lacing one's shoes. It is easily and quickly made and could serve as a fill-in job in any shop.



CONVERTIBLE PROJECT

J. F. Campbell, West Division High School,
Milwaukee, Wisconsin

The idea of having a joinery project that would be acceptable to nearly 100 per cent of the class and yet would allow for enough deviation to care for the different abilities of the individual students, prompted the design of the project described herewith.

The main features of this convertible project are apparent to any industrial-arts teacher, yet it may not be out of place to draw attention to some of the details.

First-semester boys are unknown quantities in the shop. What their individual abilities are is not known. This makes it necessary to adopt some project that will furnish enough work to assure each student earning his credit and enough more work to keep the best students not only busy but interested.

At the beginning of each semester the possibilities of this convertible project, therefore, may be explained, and each student is told that he is to make a choice later in the semester and that his choice must depend entirely upon the quality and quantity of work he is able to do.

The material for the four legs is then handed out and the work commences. The more capable students complete the telephone stand by the middle of the semester, doing nearly all the work, of course, by hand. By then, practically every student has made up his mind as to his final goal. Converting the telephone stand to a plain smoking stand by the addition of a door is next in order. The magazine pockets on the sides are attractive and in the mode just now so they are popular but require still more work.

The sewing cabinet for mother, instead of the smoking stand for dad, is a choice frequently made at home and not by the boy. If he is far enough advanced or is willing to put in some extra time, this choice is certainly commendable. The majority favor a stain-and-shellac finish, but for the boy who perhaps has struggled the hardest but whose ability is below par, it is sometimes advisable to urge him to follow the lead of others who by parental choice have elected to lacquer their stands in some pleasing combination of colors.

An extra shelf in the telephone stand adds greatly to the usefulness of that article and a little to the work of completing the most simple form of this project.

FIREPLACE SET

Gerald A. Boate, Seattle, Washington

The Shovel:

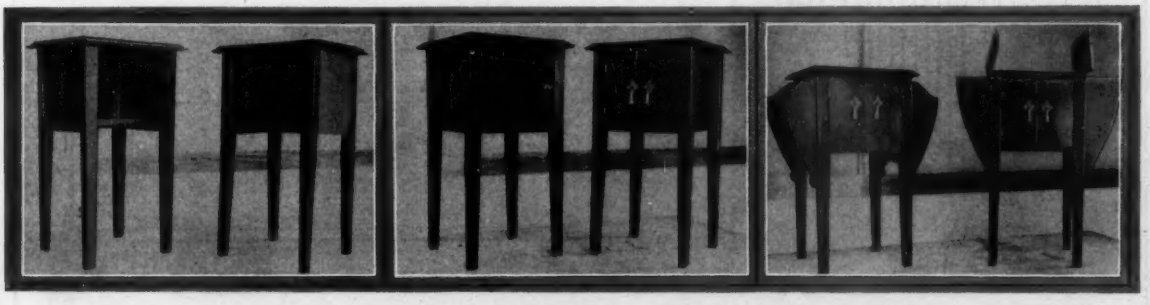
The rugged little fireplace shovel illustrated herewith is the second piece to be made for the fireplace set, description of which started on page 27 of the January, 1931, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. This shovel is well balanced and will be found to be a fine problem for seventh-grade boys. The material needed costs about 25 cents. Besides a few soft-steel rivets there are just two parts to this shovel. After making the poker, the shovel handle should present little difficulty. The handles of the poker and the shovel should, of course, be mates.

Making the Shovel Pan:

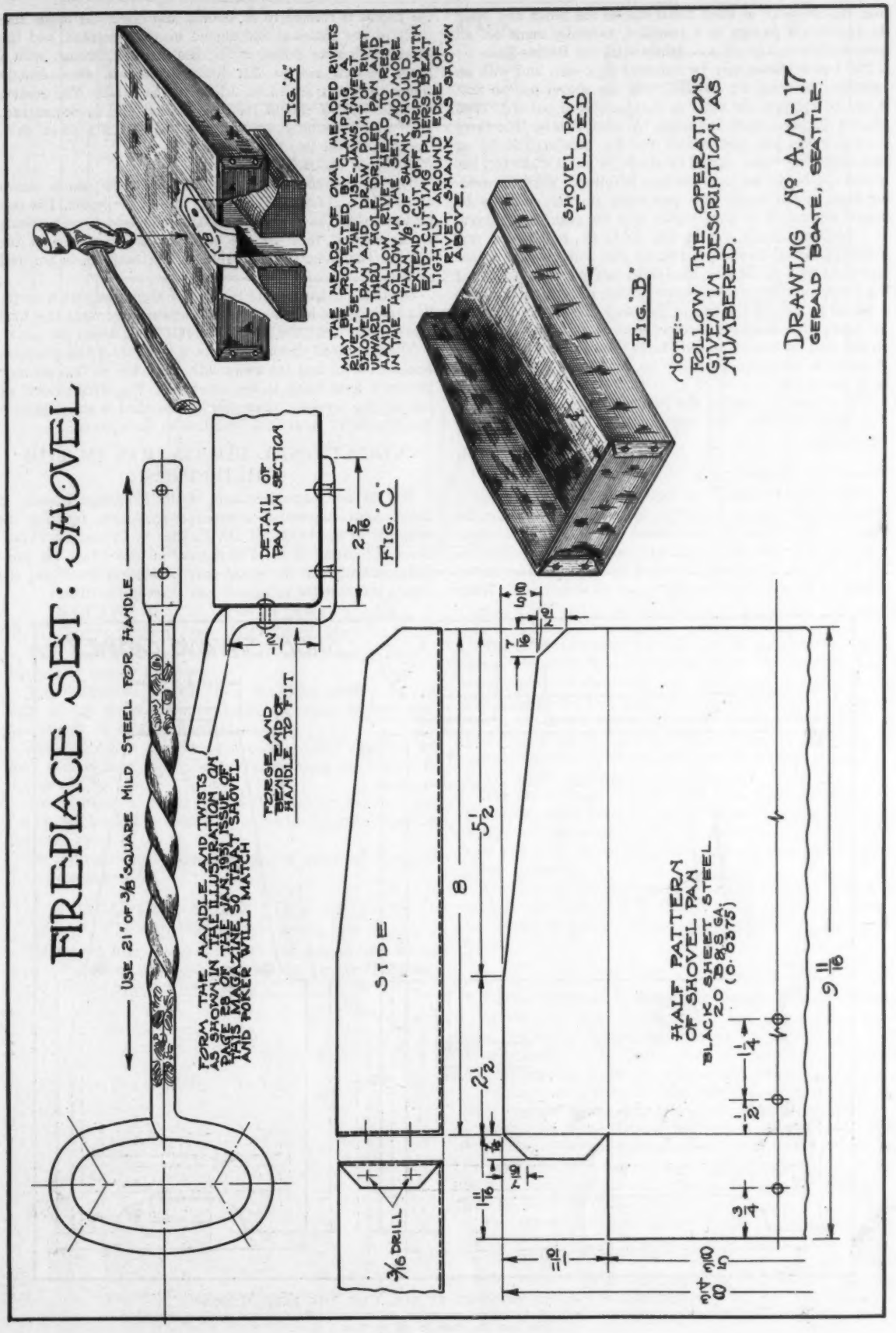
Place a piece of cardboard on a flat surface tacking it down, first trimming it to an oblong exactly 8¾ by 9 11/16 in. Upon this lay out the pattern for the shovel pan. When it is completed, cut out the pattern. Fold it to see that all upper edges of the corners are even and in line. If everything checks, mark the centers for drilling after which the pattern is ready to be used as a template.

Cutting out the Steel:

Next cut out a piece of 20-gauge black sheet steel, measuring 8¾ by 9 11/16 in., allowing a slight amount for filing the edges smooth. After all edges have been filed smooth and



A CONVERTIBLE PROJECT, DESIGNED BY J. F. CAMPBELL, MILWAUKEE, WIS.


FIREPLACE SET: SHOVEL
USE 21" OF 3/8" SQUARE MILD STEEL FOR HANDLE
FORM THE HANDLE AND TWISTS AS SHOWN IN THE ILLUSTRATION ON PAGE 69 OF THE JAN. 1931 ISSUE OF THIS MAGAZINE. THE SO THAT SHOVEL AND POKER WILL MATCH
FORGE AND BEND HANDLE TO FIT
DETAIL OF PAN IN SECTION
FIG. 'C'
FIG. 'A'
THE HEADS OF OVAL HEADED RIVETS MAY BE PROTECTED BY CLAMPING SHOVEL PAN IN THE VISE JAWS WITH UPWARD THRU HOLE AT POINT OF RIVET IN THE HOLLOW IN THE SET. HANDLE. ALLOW RIVET HEAD TO REST PAN. ALLOW NOT MORE THAN 1/8" OF SHANK SHOULD EXTEND. CUT OFF SURPLUS WITH END-CUTTING PLIERS. BEAT LIGHTLY AROUND EDGE OF RIVET SHANK AS SHOWN ABOVE.
SHOVEL PAN FOLDED
FIG. 'B'
NOTE:- FOLLOW THE OPERATIONS GIVEN IN DESCRIPTION AS NUMBERED.
DRAWING No A.M-17
GERALD BOATE, SEATTLE.
SIDE
3/16 DRILL
HALF PATTERN OF SHOVEL PAN
BLACK SHEET STEEL
20 B&S GA.
(0.0375)
8
5 1/2
2 1/2
1 1/16
9 11/16

true, lay the piece of sheet metal flat on the bench and using the pasteboard pattern as a template, carefully mark out all lines which are to be cut and lightly mark the folding lines.

The bench shears may be mounted in a vise, and with an assistant operating the handles, snip the shovel pan so that it will be cut just the same as the pasteboard pattern. Then remove all burrs from the edges by filing lightly. The three 3/16-in. holes are next drilled for the handle. The lip or back-edge rivet holes should be about ⅛ in. in diameter, but should not be drilled until the pan is formed. With the folding lines on the outside, the two edges and the end may be beaten downward at right angles over the edge of the anvil. If a hardwood block, 1¾ by 5⅜ by 12 in., is mounted vertically in the metal-working vise so that about 10 in. extend above the jaws of the vise, the folded pan may be placed over the block and the end laps beaten down into place. A clamp is useful in holding the pan to the block. Place the clamp on the edge. After the ends are bent into place, leave the clamp on and drill the two ⅛-in. rivet holes through both thicknesses of metal in each lap. This may be done using either a hand or a breast drill.

The method of riveting the handle in position is shown at A in the illustration. This same method also is used to rivet the end laps.

Forming the Handle:

All operations necessary in forming the handle are given in detail in the article on the poker, described on page 27 in the January, 1931, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. Follow these directions carefully up to operation No. 8. The end after being flattened to the proportions shown should be forged to fit the shovel pan as shown at C. When the handle is formed to fit, cooled, and dried, the inside surfaces of the flattened end should be chalk-marked, and the holes which were drilled in the pen, marked through with a sharp scratch awl so that little circles will show exactly where the holes are to be drilled in the handle. The centers of these circles should then be located and prick-punched, after which the holes are to be drilled with a 3/16-in. drill. Countersink the two bottom holes.

Riveting on the Handle:

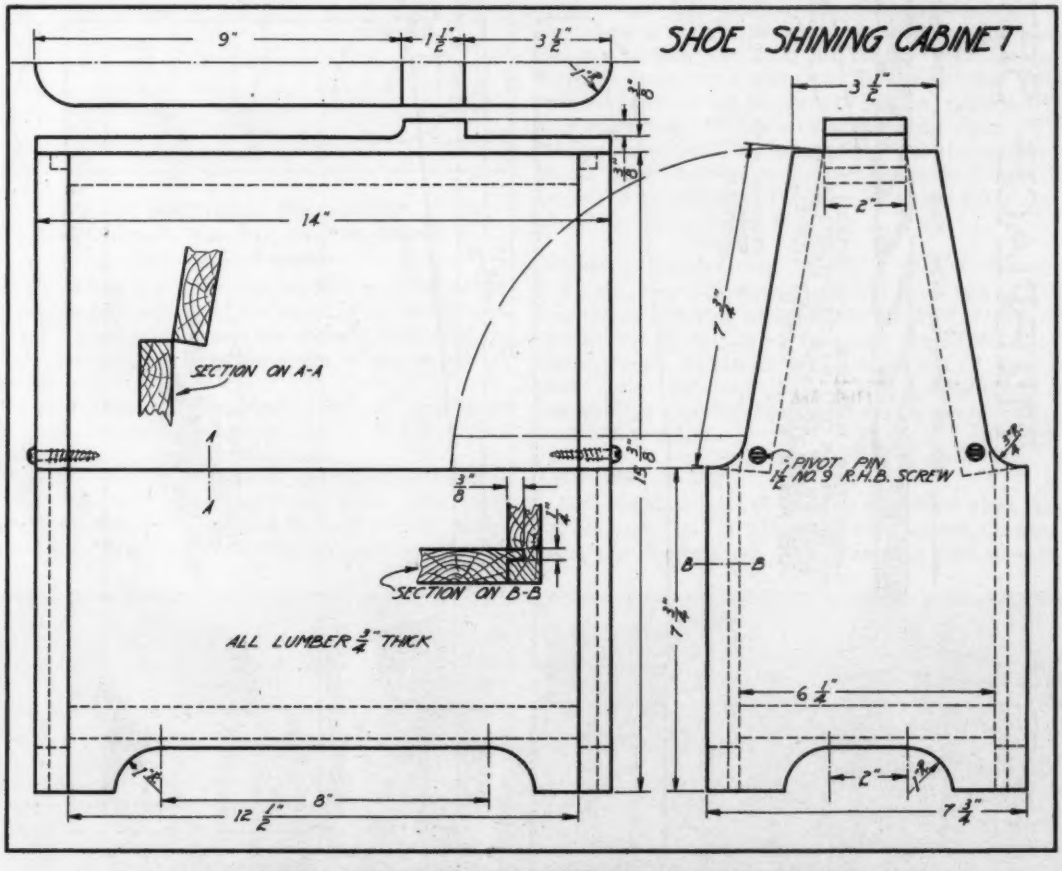
The method of attaching the handle to the pen is shown at A. The oval heads of all rivets are on the inside. The two bottom rivets have their ends flattened into a countersunk recess so that they are flat with the lower surface of the handle. The end rivet is so riveted that both heads are oval shaped.

See that the handle and pen are in alignment with a center line running the length of the pan and handle. Sight this with the eye and bend the handle carefully if it seems off center.

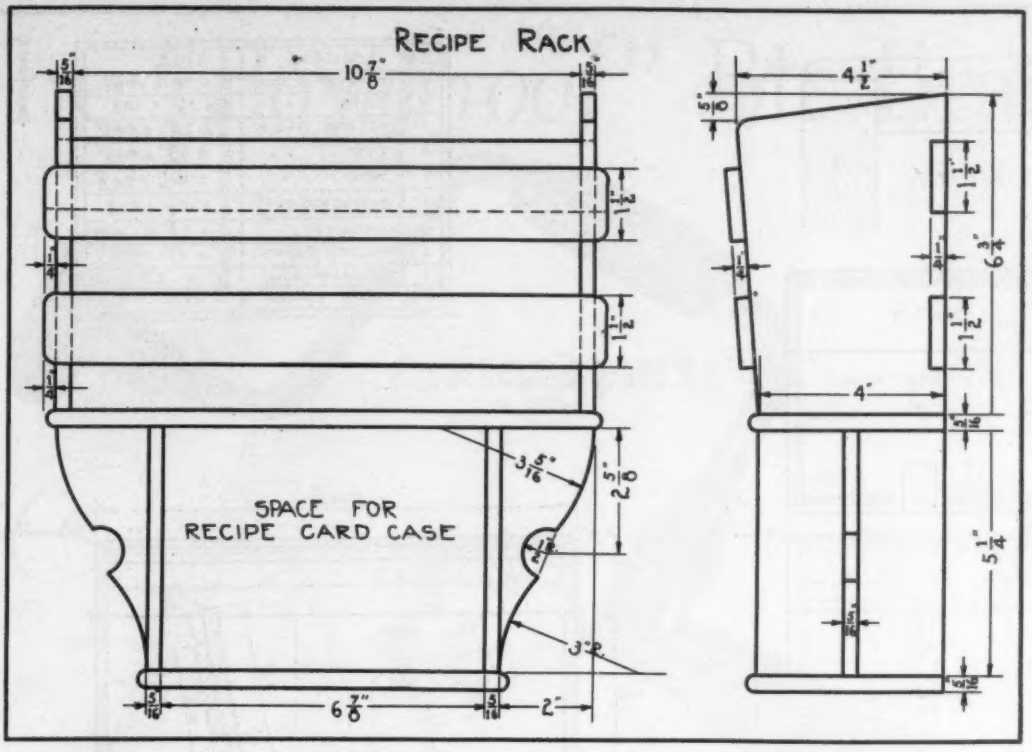
The assembled shovel should now be cleaned with medium-fine steel wool and put away with the poker so that all may receive a final finish at the same time. The third project of the set, the fireplace tongs, will be described in an early issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

VOCATIONAL EDUCATION IN THE PHILIPPINES

The division superintendents of the Philippine Islands, at their recent convention, adopted a resolution, favoring the adoption of the report of Dr. Charles A. Prosser on "Vocational Education in the Philippines," in order that the principles embodied in the report may be used in developing the future program for vocational education in the islands.



SHOE-SHINING CABINET, DESIGNED BY REX ATON, OAK PARK, ILLINOIS
When in use the doors on both sides of this cabinet are opened to prevent particles of shoe polish or dirt which drop from the shoes to soil the floor.



RECIPE RACK AND CARD CASE

R. A. Werner, Ruffner Junior High School, Norfolk, Virginia

This recipe rack and card case is a very handy piece of kitchen or pantry furniture.

The dimensions for the rack are large enough to take care of any recipe book, and also the many folders which accumulate in every household.

The dimensions for the card case are not standard, but may vary to meet individual needs, the sizes given being for a case 6¾ by 3¾ by 5¼ in.

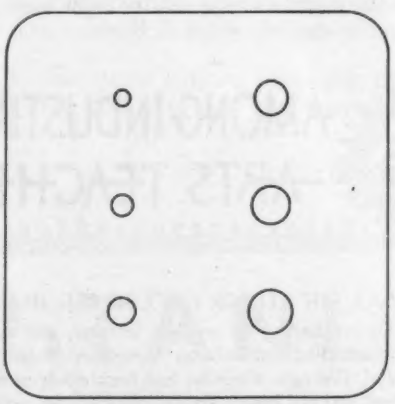
The brackets on either side of the case are not only used for design, but are necessary as braces to hold the weight of the card case.

The individual pieces are assembled by means of ¾-in. No. 5 r.h. iron screws.

A HELPFUL SHOP SUGGESTION

W. E. Wertz, High School, Henry, Illinois

Quite often when using the brace and screw-driver bit, or even when using the hand screw driver, the tool slips and causes a bad scratch or dent in the wood surface. This means much additional scraping and sanding to remove the scratch.



SCREW-DRIVER SHIELD

The guard described herewith eliminates all of the annoyances caused by these little accidents. To make the guard, take a piece of sheet iron, and drill several holes of varying size through it. This may then be slipped over the head of the screw that is to be driven, after which the screw may be turned in all of the way without danger of disfiguring the surface of the wood around the screw, even though the screw driver should slip.

The proper method of teaching is to train the boy to use the screw driver correctly so that it will not slip out of the screw slot, but even the best mechanic may make mistakes now and then. The shield guards against these little discouraging accidents.

The size of the sheet-metal shield is optional. The holes vary in size according to size of screw heads used. Round all corners and edges of the shield in order to protect the hands.

FILING CABINET

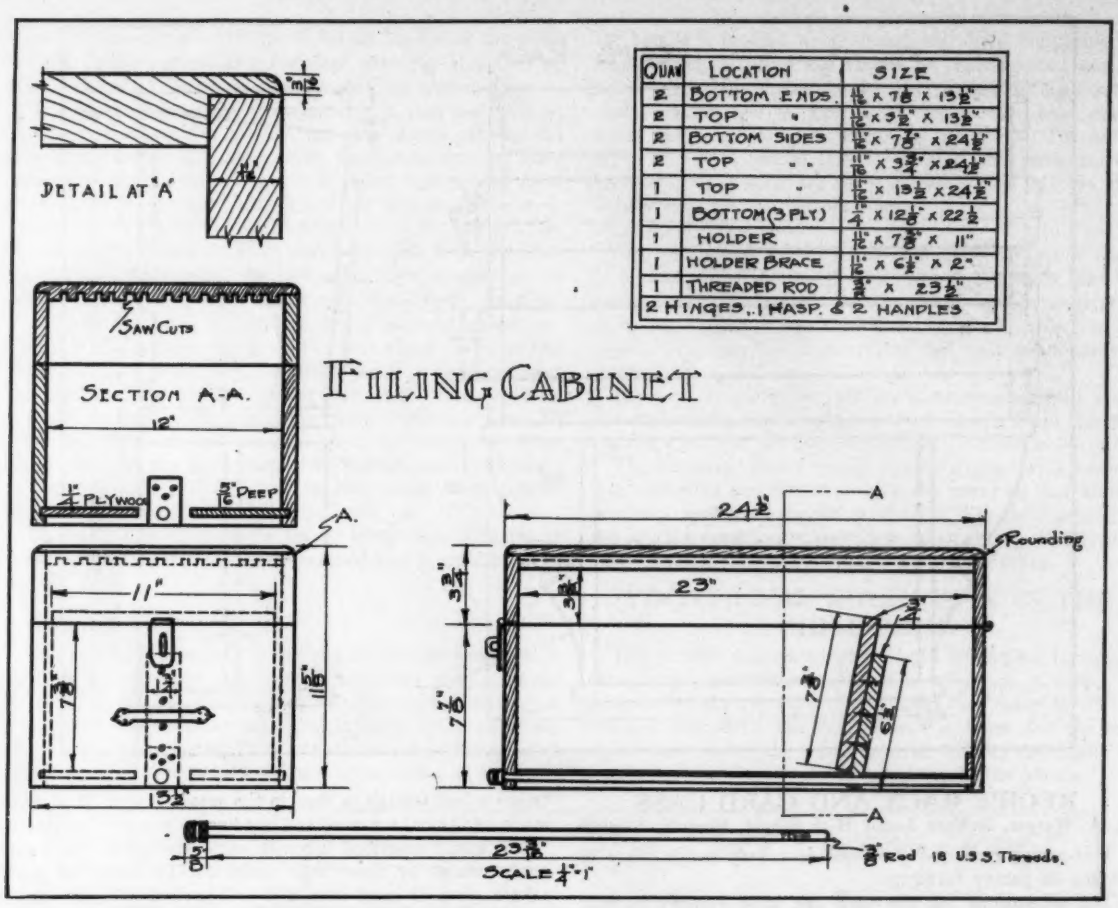
J. E. Ray, Waukegan Township High School, Waukegan, Illinois

Almost every instructor or teacher has some valuable drawings, notebooks, and possibly catalogs, that he wishes to keep in a systematic order. There are times when he wishes to lock his material up, especially when other classes are using the same classroom. Such a file also will be found very useful for filing the master drawings, Van Dykes, grades, tracings, etc.

In the top of the filing cabinet may be posted the outlines for problems in the various courses. This makes it easy for the instructor to assign the new problem, or the student may look up the next problem himself, and get his assignment directly from the classroom files.

The cabinet described herewith may be made of pine, maple, or oak. It may be provided with handles so that it may be easily carried. This portability is especially appreciated when transporting the files in a car. It takes the standard letter-sized folders, also any standard 8½ by 11-in. notebook.

Since most catalogs are being standardized to 8½ by 11



QUAN	LOCATION	SIZE
2	BOTTOM ENDS	11/16 x 7 7/8 x 13½"
2	TOP "	11/16" x 3½" x 13½"
2	BOTTOM SIDES	11/16" x 7 7/8" x 24½"
2	TOP " "	11/16" x 3 3/4" x 24½"
1	TOP "	11/16" x 13½ x 24½"
1	BOTTOM (3 PLY)	1/4" x 12 1/8" x 22½
1	HOLDER	11/16" x 7 7/8" x 11"
1	HOLDER BRACE	11/16" x 6½" x 2"
1	THREADED ROD	3/8" x 23½"
2 HINGES, 1 HASP, & 2 HANDLES		

FILING CABINET

in., the filing case also will take care of catalogs in a systematic order.

Gray pressboard guides, lettered and numbered on metal tabs, with celluloid faces, will be found valuable in quickly locating material that has been filed. The finish may be made to match the furniture or the trim of the room in which the file is to be used.

NOW, ARE THERE ANY QUESTIONS?

A SHUFFLE BOARD ON CONCRETE FLOOR

958. Q.: I have a problem that I would appreciate your help on. We are making a shuffle board on a concrete floor and would like to know how we could make the surface smooth and slippery without resurfacing or going to too much expense.—*C. E. A.*

A.: To prepare the concrete floor that is to be used as a shuffle board, give it several coats of "Cemcoat." This gives the floor a tough, durable, high gloss finish. Cemcoat may be obtained in various colors and is manufactured by L. Sonneborn Sons, Inc., 114 Fifth Avenue, New York City.

If necessary, a first coat of cement filler and dustproofer might be used. This material, too, may be obtained from the same firm.

After the floor has been finished as described, ordinary wax used on dancing floors may be dusted over the floor and rubbed into it in order to give the slipperiness that you want.

REFINISHING A FORD

959. Q.: I am refinishing a Ford sedan. Is a good lacquer better than a good enamel for the purpose? If enamel is used, is it necessary to use a primer on the bare metal or is it sufficient to use two coats of the enamel (as the paint dealer assured me would be entirely satisfactory)?—*G. H. L.*

A.: In regard to the Ford car, I believe that you will have the best results with a one-day enamel, as Pratt & Lambert's Effecto Auto Enamel, or Murphy's DaCote. Have the car cleaned at a washing station with soda and water-steam combination for the paint shop; spot-sand where the metal is bare; apply a coat of metal primer, then one or two coats of quick-drying enamel to get the amount of body desired in the finish. I do not believe that the finish will have good adhesion under Florida conditions, especially on steel bodies, if the metal primer is omitted.—*Ralph G. Waring.*

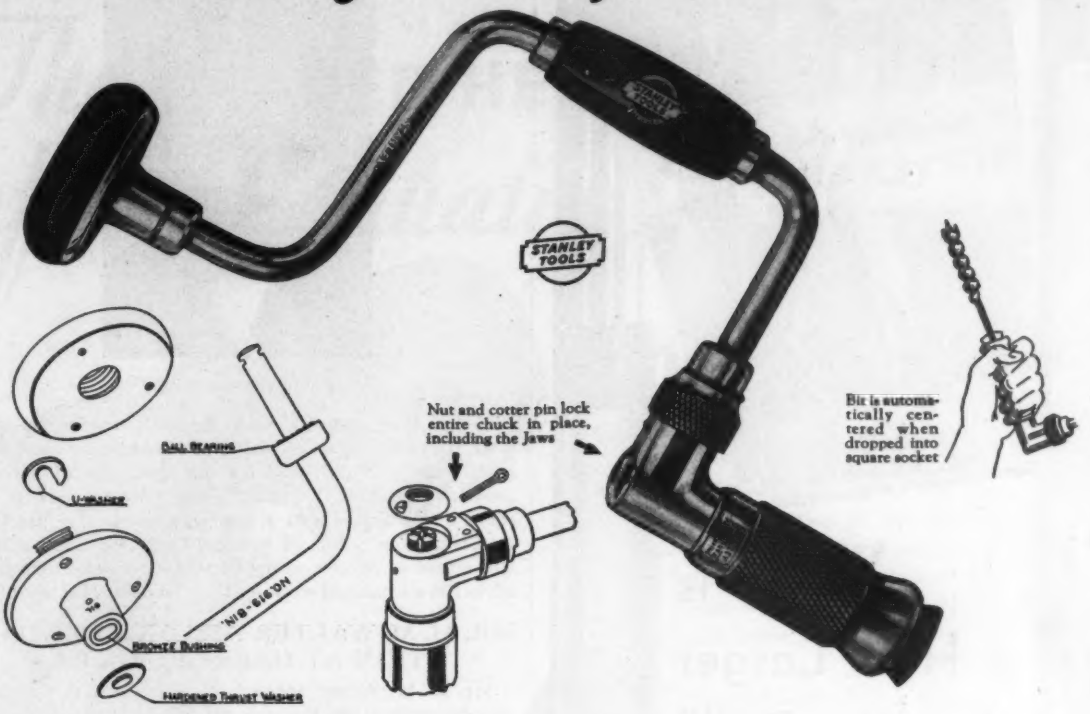
AMONG INDUSTRIAL-ARTS TEACHERS

PASSING OF HENRY TURNER BAILEY

Henry Turner Bailey, art teacher, lecturer, and author, of Scituate, Mass., died suddenly on November 26 in the West Side Hospital, Chicago, where he had been confined following an operation on his knee. Death followed an acute heart attack.

(*Continued on page 14A*)

The "*Boy-Proof*" Bit Brace


STANLEY TOOLS
Nut and cotter pin lock entire chuck in place, including the Jaws
Bit is automatically centered when dropped into square socket
BALL BEARING
U-WASHER
BRONZE BUSHING
HARDENED THRUST WASHER

STANLEY NO. 919

WE RECOMMEND our No. 919 Bit Brace as the most "boy-proof" brace for the school shop. It is designed to take square taper shank bits only and therefore answers at least 90% of all the school shop requirements.

The bit *centers itself* in a square steel socket which provides a solid driving seat and takes the entire driving load.

The jaws cannot jam, slip or come out even under the heaviest load.

The entire chuck, including the jaws, is locked in place with a nut and cotter pin.

Bronze bushed, ball bearing head helps to make this a smooth working, long wearing Brace.

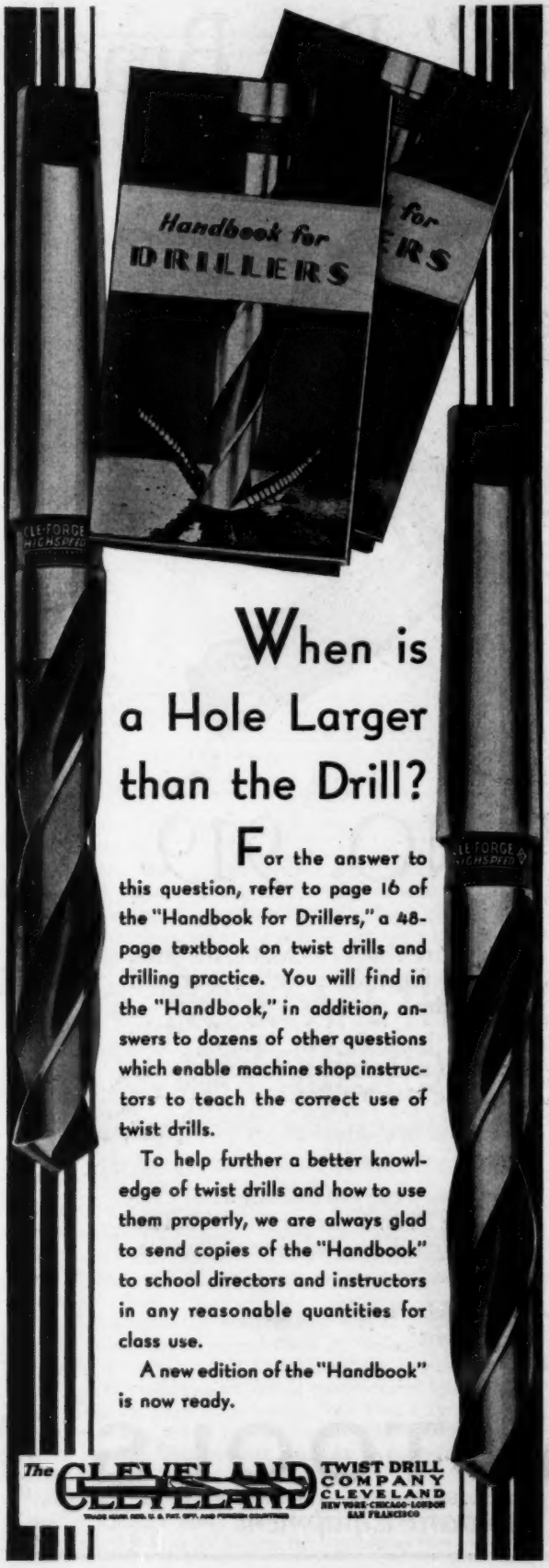
Made in five sizes: 6″, 8″, 10″, 12″ and 14″ sweeps.

Have you a copy of Stanley Tool Catalog No. 34 with the special School Index? We will be glad to send you one.

THE STANLEY RULE & LEVEL PLANT
Educational Department
New Britain, Conn.

STANLEY TOOLS

Stanley Equipment is Standard Equipment


Handbook for
DRILLERS
When is a Hole Larger than the Drill?
For the answer to this question, refer to page 16 of the "Handbook for Drillers," a 48-page textbook on twist drills and drilling practice. You will find in the "Handbook," in addition, answers to dozens of other questions which enable machine shop instructors to teach the correct use of twist drills.
To help further a better knowledge of twist drills and how to use them properly, we are always glad to send copies of the "Handbook" to school directors and instructors in any reasonable quantities for class use.
A new edition of the "Handbook" is now ready.
The CLEVELAND TWIST DRILL COMPANY CLEVELAND
NEW YORK-CHICAGO-LONDON
SAN FRANCISCO

(Continued from page 38)

Mr. Bailey was born in Scituate, Mass., Dec. 9, 1865. He was a graduate of the Boston Normal School, in the class of

HENRY TURNER BAILEY

1887, and later studied abroad. He was a teacher and supervisor of drawing in several cities of Massachusetts and was a special agent of the state for the promotion of industrial drawing from 1887 to 1903. From 1903 to 1917 he was editor of the *School Arts Magazine*, and was also director of the Chautauqua School of Arts and Crafts for nine years. He also served as director of the Cleveland School of Art and as adviser in educational work for the Cleveland Museum of Art.

MR. M. M. WALTER ASSUMES NEW POSITION AT HARRISBURG, PA.

Mr. M. M. Walter, formerly associate professor of industrial education at the Pennsylvania State College, has assumed the position of director of the Bureau of Rehabilitation of the State Department of Labor and Industry, Harrisburg, Pa. As director of the bureau, Mr. Walter will have charge of civilian rehabilitation as carried out in conjunction with the state and federal law.

MR. M. M. WALTER
Director of Bureau of Rehabilitation, Harrisburg, Pa.

Mr. Walter who is a native of Pennsylvania, received his education in the schools of that state. He was given an A.B. degree by Bucknell University, a law degree by Temple University, and an M.A. degree by the State College. He has also completed a graduate course leading to a Ph.D. degree at the State University.

Mr. Walter is an expert in vocational education, a successful teacher, and a forceful administrator and he brings to his new position a background of training and experience which will be helpful in promoting the civil rehabilitation program of the state.

The GEARED HEAD LATHE *after graduation...* Why not now?

THE Regal Lathe, built by LeBlond, aids in the correct preparation of the student. It is an eight-speed geared head lathe of modern engineering design — the kind the graduate will operate in a modern industrial shop.

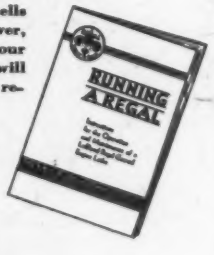
It supplements the most exacting teaching — with nothing to unlearn later on.

Its safety, splendid construction and unusual features appeal strongly to instructor and student.

Write for complete details.

Send for this booklet

Ordinarily this book sells for 25 cents. However, your request on your school's stationery will bring you a copy by return mail—free.



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Some REGAL Advantages

The Regal Lathe must meet the LeBlond test and be worthy of the LeBlond guarantee of expert workmanship and unusual precision. It is equipped with an eight-speed selective geared headstock for safe, simple and accurate changing of speeds and feeds; long bearing carriage, deep, wide bed; feed rod to take the wear off the lead screw. Moving parts enclosed. Lathe is made in a range of sizes to meet your requirements and sold at a price that means buying economy. Shipped fully equipped (including motor), ready to run.

THE R. K. LEBLOND MACHINE TOOL CO.

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SEE OUR DATA IN BRUCE'S SCHOOL SHOP ANNUAL 1931 EDITION

To Meet *Your* Conditions

E. H. Sheldon & Company have developed many new designs and items to meet your conditions.

Diversified vocational education has become the aim of school work, and this has been a problem to the smaller schools that could not maintain a multitude of separate departments.

One or two shops equipped with benches or tables that would serve for several purposes has been the answer to that. E. H. Sheldon and Company offer you a complete line of standard and custom built items, and a new complete catalog showing many items which will enable you to do the many tasks with the same facilities as the specifically equipped departments of the larger institutions.

Write us your problem.

E. H. SHELDON & COMPANY, Muskegon, Michigan

SCHOOL SHOP EQUIPMENT NEWS

FOR THE SUPERVISOR OR TEACHER WHO DESIRES TO KEEP ABREAST WITH THE NEWS OF NEW MACHINERY, TOOLS, SUPPLIES, ETC.

NEW PEASE JUNIOR SHEET DRYER

The C. F. Pease Company, Chicago, Ill., manufacturers of blue-printing supplies and equipment, has announced the marketing of its junior sheet dryer. This is a new, inexpensive sheet dryer, which brings within the reach of all, a means of quickly drying blue prints and photo prints.

The dryer, which is a fitting companion to the Pease blue-printing, photostat, and rectigraph machines, is especially useful as a dryer for moderate-sized blue prints, negatives, and blue- and brown-line prints up to 24 in. wide. With the use of a chromium-plated cylinder, it may also be used for drying photo prints. It possesses many of the exclusive features found in the large Pease dryers. It is simple to operate, produces smooth and wrinkle-free prints, and is economical to maintain. The prints are fed into the dryer over a brass scraper rod and up to an inclined feed table where the water is drawn away from the drying drum. All surplus water is collected in a drip pan, which is adjustable for long or short prints. After drying, the prints are automatically returned to the adjustable tray which is then pushed back out of the way. The revolving drying drum is furnished with either gas or electric heating elements. The dryer is sturdily constructed with an angle-iron frame, finished in olive-green enamel. It is equipped with an ⅓-h.p. motor and variable gear drive for two speeds, and with a special handscrew regulator for controlling the canvas band.

Complete information and prices may be obtained by addressing the Pease Company at 813 North Franklin St., Chicago, Ill.

NEW LUFKIN TAPE RULE

The Lufkin Rule Company, of Saginaw, Mich., has just issued its Crescent tape rule, a combination tape rule, which has the convenience of a pocket tape and the utility of a rule. The tape automatically winds into a sturdy roll and when

withdrawn, becomes rigid like a rule. It is always ready for use, is easy to carry in the pocket, and is convenient for the mechanic, engineer, shopman, and others who have use for such a useful tool.

The Crescent tape rule is simple in operation, is never dangerous, is always under control, and a simple pressure recoils it more quickly than any rule can be folded.

Complete information and prices may be obtained by any shop instructor upon request.

NEW GALLMEYER-LIVINGSTON UNIVERSAL SAW

The Gallmeyer & Livingston Company, Grand Rapids, Mich., manufacturers of woodworking machinery, announces the marketing of its new No. 14 Union Universal Saw Bench.

This saw is of the motor-on-arbor type. It has a rigid one-

(Continued on page 19-A)

ADVERTISING PAGES REMOVED

(Continued from page 16-A)

piece base and may be obtained either with the stationary-type base or a portable-type base. The motor-on-arbor construction eliminates all gears, belts, and flexible couplings.

The saw may be tilted up to 40 degrees and locked in any position. It is equipped with a crosscut gauge and a ripping gauge, either of which may be used on either side of the saw, a saw guard, and a splitter guard. The standard equipment is a 12-in. saw which may be raised high enough to cut stock 2½ in. thick. The motor is of the ball-bearing repulsion induction type. A suitable switch is mounted on the front of the column and the portable-type saw bench is further equipped with a heavy-duty lamp-socket motor. The machine permits the use of dado heads up to 1½ in. wide.

ISSUE GENERAL SHOP BULLETIN

The South Bend Lathe Works, of South Bend, Ind., has issued its new Bulletin No. 50, which is devoted to the planning, arrangement, and equipment of the small general shop.

The bulletin offers outlines of typical general shop courses in machine-shop work, motor mechanics, electricity, mechanical drawing, woodworking, and forging, together with a list of equipment, tools, and machinery required. There is also a brief list of reference books.

A copy of the bulletin will be sent to any school-shop instructor who requests it.

NEW PUBLICATIONS

Automotive Service

By Ray F. Kuns. Cloth, 1120 pages, 6¾ by 9¼, illustrated. Price, $6.50. Published by The Bruce Publishing Company, Milwaukee, Wis.

This complete and authoritative book is based on a careful analysis made of the automotive trades. In its 1120 pages it exhaustively treats of the entire subject. It is especially adapted to the training of tradesmen in the various branches of the automotive trades, and will be found equally useful in the school and in the commercial shop; in the former as a textbook and in the latter as a valuable guide.

The author has carefully analyzed the work of the auto mechanic, auto electrician, and general service man, and has divided it into jobs. These jobs have then been written up in such a manner that the technical and the practical information is covered in a comprehensive, readable manner. The book also is useful for self-instruction.

Some of the jobs are broken up into operations, others show optional methods, so that they may be more easily adapted to the shop equipment on hand. The completeness of the book makes it useful in any phase of automotive training, and the teacher in the junior high school, the senior high school, the technical high school, the part-time or full-time vocational school, or in teacher-training institutions may easily and quickly decide what to include in his course by making a careful selection of those jobs described by the author which may fit the peculiar needs of the school for which the course is intended.

Simple Colonial Furniture

By Franklin H. Gottshall. Cloth, 124 pages, 7¾ by 11, illustrated. Price, $2.50. Published by The Bruce Publishing Company, Milwaukee, Wis.

Cabinetmaking teachers will be delighted with this new book on colonial furniture. It is divided into three sections,

(Continued on page 20-A)

Practical TRAINING

. . . . . requires practical facilities

The Cutawl, an interesting, inexpensive electrical cutting device is a manual training utility. Cutting of toys, puzzles, sets for amateur theatricals, decorations for commencement, stencils, models, advertising displays—any project to be wrought from sheets of metal, wood, cloth, wallboard, paper or cardboard, no matter how intricate the designs, may be interestingly produced by any pupil with the Cutawl. It is safe, simple, educational—portable and readily adaptable to classroom operation. Weighs only 13 pounds. Let the students cut out and put to practical use the designs they themselves have created. Let the Cutawl make every school function a display of student talent from beginning to end and also train them for the highly profitable vocation of Commercial Display.

The Cutawl DEVELOPS INGENUITY

FREE TEN-DAY TRIAL—NO RISK

A free trial at our risk will convince you of the practical possibilities of the Cutawl for vocational training. Test it thoroughly; allow your class to operate it and note their favorable reaction. The trial will involve no obligation.

INTERNATIONAL REGISTER CO.
29 S. Throop St., CHICAGO, ILLINOIS

MAIL THIS COUPON AT ONCE!

12-31

INTERNATIONAL REGISTER CO.
29 S. Throop St., Chicago, Ill.
Gentlemen: You may send a detailed description of the Cutawl. Also let us know how we may secure a Cutawl on Ten Day free Trial.

My Name_____
School_____ Address_____
City_____ State_____

Today It Must Be Steel!

Pat'd and Pat's Pending

Fig. 484 — "HALLOWELL" Bench-Leg of Steel, for steel and wood tops. Exceptionally rigid. 30 sizes.

Pat'd and Pat's Pending

Fig. 924—"HALLOWELL" Work-Bench of Steel, with laminated plank in front; angle tie bars below. Carried in stock.

Pat'd and Pat's Pending

Fig. 928 — "HALLOWELL" Work-Bench of Steel, with a laminated all-wood top. Open below. Facilitates sweeping.

Pat'd and Pat's Pending

Fig. 732 — General view of the "HALLOWELL Work-Bench of Steel, with back board, end pieces, etc. Carried in stock.

We have crowded the space with pictures to show different types of "HALLOWELL" Shop Equipment of steel, suitable for Vocational Education.

The legend below each cut is self explanatory, but to fully appreciate our "HALLOWELL" Line get our

BULLETIN 433

STANDARD PRESSED STEEL CO.

BRANCHES BOSTON CHICAGO DETROIT

JENKINTOWN, PENNA.

BOX 552

BRANCHES NEW YORK SAN FRANCISCO ST. LOUIS

(Continued from page 19-A)

the first devoted to the elements of furniture design, the second on the adaptation of these elements to the design of colonial furniture, and the third on the subject of furniture finishing, in which the author takes the stand that true copies of pieces of colonial furniture receive no enhanced value from the foolish attempts made by some in faking them up to look like antiques. The book is well illustrated and contains detailed drawings of 39 different pieces.

IAVE ASSOCIATION AND CONVENTION NEWS

THE VOCATIONAL EDUCATION SOCIETY OF BOSTON MEETS

The Vocational Education Society of Boston held its regular monthly meeting on Saturday, November 14, at the Hotel Westminster, Boston. The speaker of the evening was Mr. John E. Alcott, state supervisor of vocational education in industry and business, who took for his subject, "Art in Industry and Business."

Mr. Alcott, in his talk, traced the early history of art from the handcraft days down to the modern mass-production methods. He pointed out that there was no such thing as mechanical limitation, and that the designer must keep this idea constantly before him. He argued that with proper training, designers may turn out a limited number of good designs. At the close of the talk, the members were invited to ask questions.—*L. A. Van Ham.*

ILLINOIS VOCATIONAL SOCIETY MEETS IN CHICAGO

The Illinois Vocational Society held its annual meeting on November 6 at the Hotel Sherman, Chicago.

Following the program a business session was held, with election of officers for the next year. Mr. Henry H. Hagen, principal, Crane Technical High School, Chicago, was elected president; Mr. D. W. Castle, Township High School, Joliet, secretary; and Mr. N. F. Fultz, J. Sterling Morton Township High School, Cicero, treasurer. The vice-presidents are: Ruth Blankmeyer, Oak Park; W. C. Maxwell, Hinsdale; Mary Fuller, Chicago; and W. C. Hall, Chicago. Prof. A. B. Mays, Urbana, Ill., and Mr. L. P. Elliot, Peoria, Ill., were elected as new members of the board of directors.

IAVE NEWS — NOTES

Coöperative Vocational Plan at Toledo, Ohio

A coöperative plan has been adopted in the vocational school at Toledo, Ohio, for the training of trade students. Under the plan the student works a week at a trade, then a week at related subjects in the course. Formerly the students worked half a day at a trade and the other half at related subjects.

Shop Building at Curtis School, Lincoln, Nebr.

A new shop building has been constructed for the Curtis School of Agriculture, Lincoln, Nebr., at a cost of $20,000.

(Continued on page 23-A)

ADVERTISING PAGES REMOVED

YOU WILL BE AMAZED

AT THE REMARKABLE QUALITY BUILT INTO

The New Delta Double-Duty Drill Press

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No matter how small your appropriation, you can now afford the drill presses your shop needs. For the New Delta Double-Duty Drill Press is not only a remarkable all-around tool, but sells at a remarkable price.

Consider these features: Heavy, husky quill, graduated for depth drilling, and provided with adjustable pointer for accurate gaging. Perfectly balanced, ball-bearing spindle with lubricant sealed in. Spindles easily and quickly changed for special jobs. Independent ball-bearing drive pulley takes belt pull away from spindle, permitting free, sensitive operation, and avoiding misalignment and wear. Six speeds. Self-tightening chuck, 3/8" capacity. Heavy, well-ribbed table, slotted for clamping work. Table tilts through full 360 deg., yet is instantly and positively returnable square with spindle. Automatically lubricated idler pulleys.

Used for either wood or metal work, this drill press will quickly prove its value in any shop, large or small. Boring, routing and sanding in wood done as easily and efficiently as metal work. Let us tell you how.

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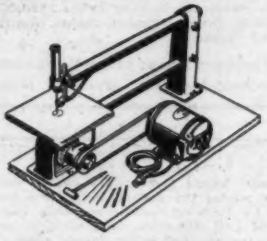

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Dept BP-1-32—3775 N. Holton St.—MILWAUKEE, WIS.

(Continued from Page 20A)

Welding Taught at Springfield, Ohio

A class in welding has been established in the night school at Springfield, Ohio. A fee of $7.50 will be charged each student who enrolls. The estimated cost of the work is $600 for a four-year period, or an average of $150 a year.

Vocational Guidance Aids Gary Students

Vocational guidance has led 1,962 high-school students of Gary, Ind., to select their lifework and to apply themselves to their studies, according to Mr. G. E. Wulfing, vocational supervisor. Vocations have been selected by the students, ranging from archeology to forestry. A table of progress has been prepared to show the progress of guidance among the students.

Plan Addition to Vocational School

An addition for the Blodgett Vocational School, Syracuse, N. Y., is planned in the near future. An industrial course will be offered which will give the young man a strong background for industrial work. The industrial course will have a broad scope, and the various subjects will be closely related.

Welding Course at La Crosse, Wis.

Welding and cutting for machinists, plumbers, and automobile mechanics are being offered in the vocational school at La Crosse, Wis. The work is being offered in twenty courses, arranged to meet the needs of the beginner and the advanced worker.

Aviation Taught at Sheboygan, Wis.

A class in aviation has been established in the Vocational School at Sheboygan, Wis. Mr. D. C. Holihan is the instructor.

Portland Cement Research at Mellon Institute

The Mellon Institute of Industrial Research, Pittsburgh, Pa., has announced the establishment of an industrial fellowship by the Green Bag Cement Company of Pittsburgh. The investigational work of the fellowship, which is to be carried on by Mr. R. C. Briant, will be devoted to studies of the chemical and physical properties of Portland cement and the development of certain new cement products. Mr. Briant goes to Mellon Institute from the Bureau of Standards at Washington, where he had been engaged in research under the auspices of the Portland Cement Association.

Train Students for Electrical Field

An advisory committee, consisting of eight men, has been formed at Waukesha, Wis., to direct the training of young men for the electrical field. Mr. William Patterson, electrical instructor in the Vocational School, and Mr. O. B. Lindholm, director, are two of the members of the committee. The other members will represent the contractors, the journeymen electricians, and the maintenance departments.

Plan New Trade School at McKeesport, Pa.

Plans have been started for the erection of a trade school in the rear of the present high-school structure.

Teachers Win Pay Credit for Nonteaching Service

Teachers who have had experience in business or trades are entitled to credit for such experience in fixing the salaries to be paid them as teachers in the New York City schools, according to a decision of State Commissioner of Education Frank P. Graves. This practice had been followed by the board of education until the court of appeals ruled that credit for trade experience could not be allowed in determining a teacher's pension.

The School Shop Shopping Guide

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